

FIG. 1

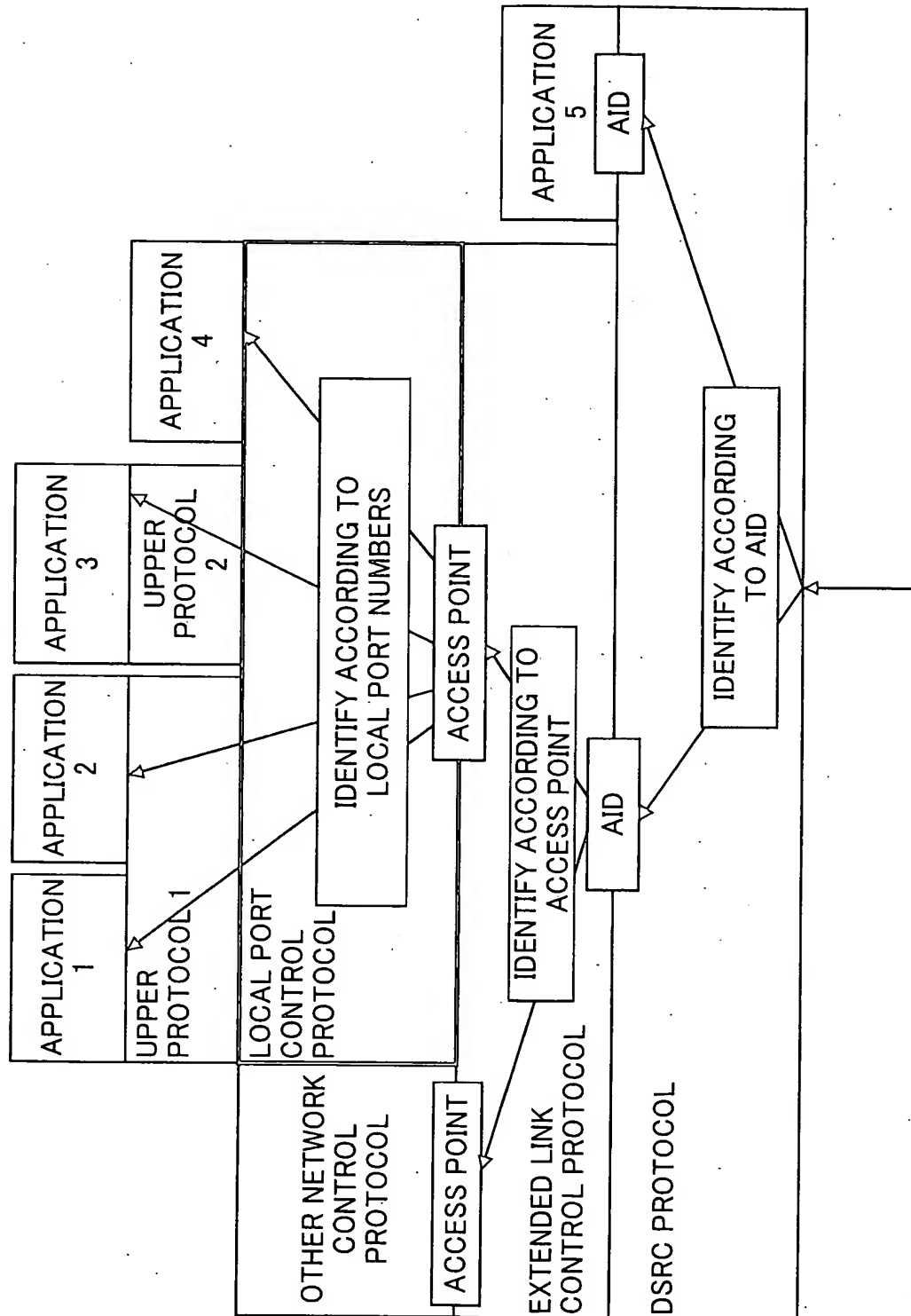


FIG. 2

LOCAL PORT NO.	APPLICATION	REMARKS
0	UNUSED	
1 TO 0x07FF	SAME AS DEFINITION OF UDP PORT NUMBER	SAME AS PORT ASSIGNMENT FOR UDP APPLICATION SPECIFIED IN RFC 1700
0x0800	UNUSED	
0x0801	DEFAULT NCP	RECEIVING PORT FOR BASE STATION APPLICATION IN TAG-TYPE TERMINAL
0x0802	ECHO	RECEIVING PORT FOR ECHO SERVICE
0x0803	ECHO REPLY	RECEIVING PORT FOR REPLY TO ECHO
0x0804 TO 0x0807	RESERVED FOR ID NOTIFICATION APPLICATION	RECEIVING PORT FOR APPLICATION IMPLEMENTING ID NOTIFICATION SERVICE FOR TERMINALS OTHER THAN TAG-TYPE TERMINAL
0x0808 TO 0x080F	RESERVED FOR PUSH-TYPE DELIVERY APPLICATION	RECEIVING PORT FOR APPLICATION PROVIDING PUSH-TYPE INFORMATION
0x0810 TO 0x085F	RESERVED FOR CHARGING/PAYMENT	RECEIVING PORT FOR APPLICATION IMPLEMENTING CHARGING SERVICE
0x0851 TO 0x0FFE	RESERVED FOR DSRC NON-NETWORK-TYPE APPLICATION	
0x0FFF	LOCAL PORT PROTOCOL MANAGEMENT SERVICE	RECEIVING PORT FOR LOCAL PORT PROTOCOL MANAGEMENT SERVICE
0x1000 TO 0xFFFF	ARBITRARY PORT	

FIG. 3

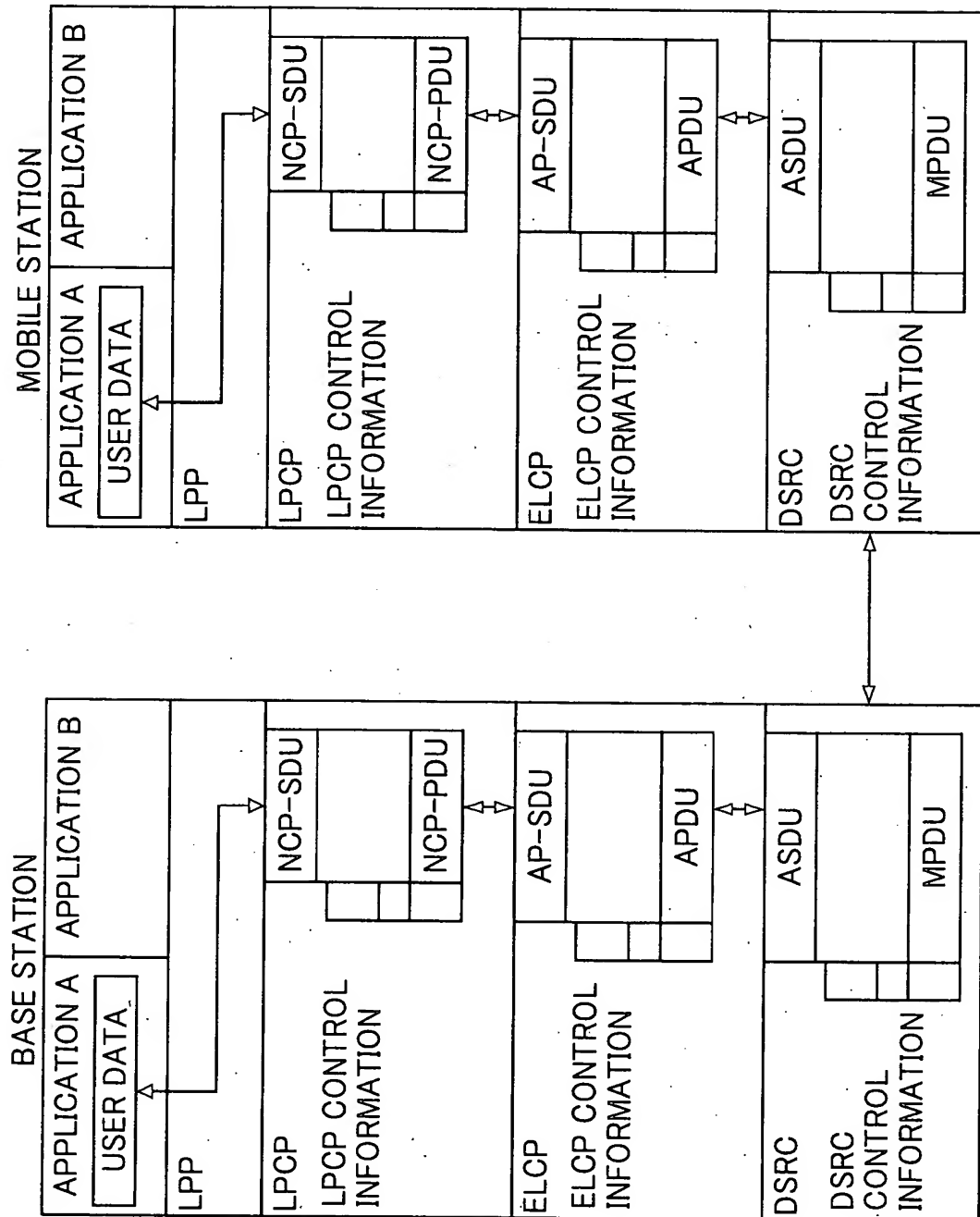


FIG. 4

PRIMITIVE TYPE	ABBREVIATION	DESCRIPTION
REQUEST	REQ	USED WHEN AN UPPER LAYER REQUESTS A SERVICE FROM A LOWER LAYER.
INDICATION	IND	USED WHEN A LOWER LAYER NOTIFIES AN UPPER LAYER OF A SERVICE FROM THE COUNTERPART.

FIG. 5

SYMBOL	DESCRIPTION
M (MANDATORY)	MANDATORY PARAMETER
O (OPTIONAL)	OPTIONAL PARAMETER
(=)	INDICATES THAT THE PARAMETER VALUE IS EQUIVALENT TO THE VALUE OF THE IMMEDIATELY PRECEDING PRIMITIVE ("REQ" IN THE CASE OF "IND").

FIG. 6

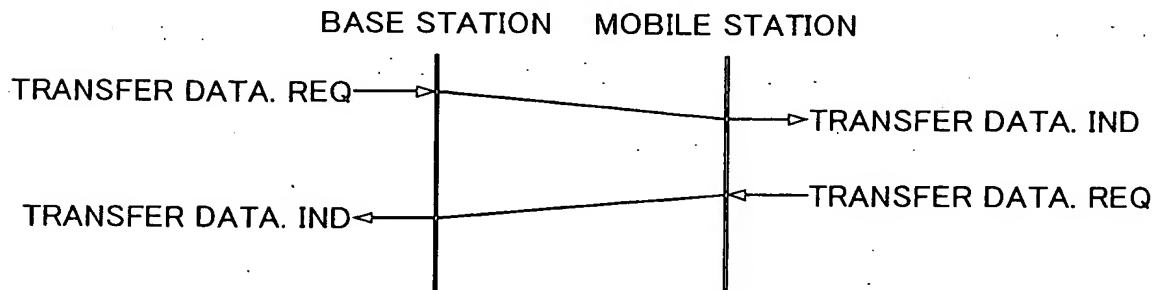


FIG. 7

PRIMITIVE PARAMETER	TRANSFER DATA	
	REQ	IND
LINK ADDRESS	M	M(=)
SOURCE PORT	M	M(=)
DESTINATION PORT	M	M(=)
USER DATA SIZE	M	M(=)
USER DATA	O	O(=)

FIG. 8

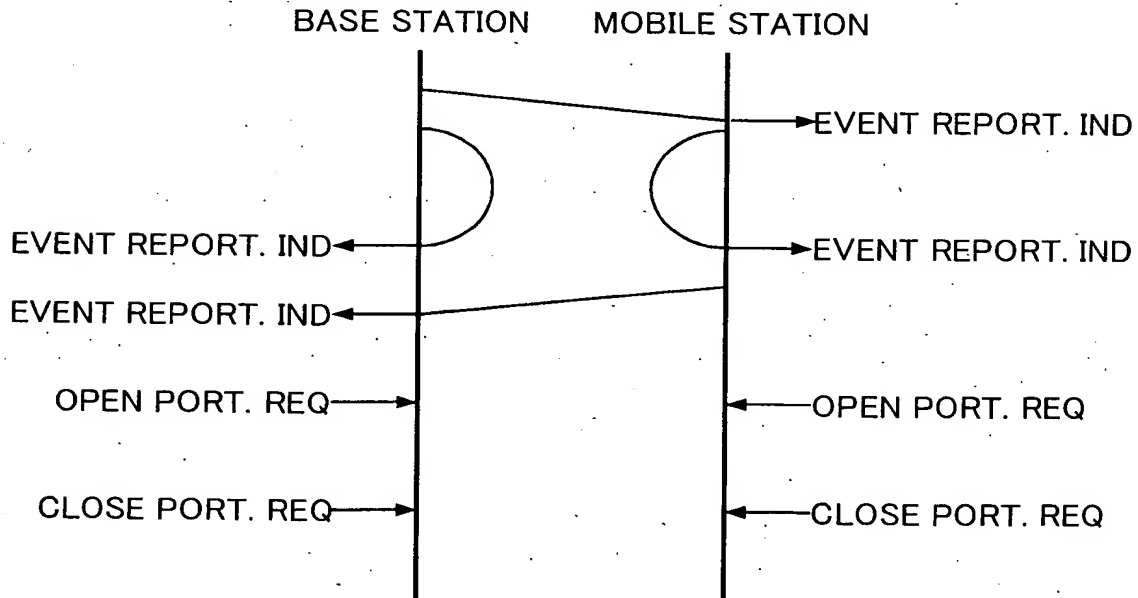


FIG. 9

PRIMITIVE PARAMETER	EVENT REPORT	
	REQ	IND
LINK ADDRESS	—	M(=)
EVENT CODE	—	M(=)
EXTENTION PARAMETER	—	M(=)

FIG. 10

PRIMITIVE PARAMETER	OPEN PORT
	REQ
PORT	M
TYPE	O
CODE	O

FIG. 11

PRIMITIVE PARAMETER	CLOSE PORT
	REQ
PORT	M

FIG. 12

PORT NO	PRIMITIVE TYPES	EVENT CODES

FIG. 13

LID	EQUIPMENT ID

FIG. 14

	7 (MSB)	6	5	4	3	2	1	0 (LSB)
1	ACCESS POINT IDENTIFIER LOCAL PORT CONTROL (1)				PROTOCOL IDENTIFIER MESSAGE (0)			
2	SOURCE LOCAL PORT NUMBER (HIGH-ORDER)							
3	SOURCE LOCAL PORT NUMBER (LOW-ORDER)							
4	DESTINATION LOCAL PORT NUMBER (HIGH-ORDER)							
5	DESTINATION LOCAL PORT NUMBER (LOW-ORDER)							
6	LENGTH OF USER DATA PORTION							
	CONTENTS OF USER DATA PORTION							

FIG. 15

PROTOCOL IDENTIFIER	DESCRIPTION	OPTION FIELD TYPE
0	DATA TRANSFER	LPCP TRANSFER DATA PDU TYPE
1	EVENT NOTIFICATION	LPCP EVENT PARAMETER TYPE
2-15	RESERVATION	

FIG. 16

	7 (MSB)	6	5	4	3	2	1	0 (LSB)
1	ACCESS POINT IDENTIFIER LOCAL PORT CONTROL (1)				PROTOCOL IDENTIFIER EVENT REPORT (1)			
2	EVENT CODE "EVENT CODE"							
3	LENGTH OF "EXTENSION PARAMETER"							
	CONTENTS OF "EXTENSION PARAMETER"							

FIG. 17

EVENT CODE	DESCRIPTION	NOTIFICATION TARGET	CONTENTS OF "EXTENSION PARAMETER"
0	PROHIBITED TO USE.		NONE
1-3	NOT USE.		NONE
4	DATA SIZE HAS EXCEEDED THE UPPER LIMIT VALUE.	LOCAL STATION	
5	SENDING SERVICE HAS BEEN ABORTED	LOCAL STATION	
6	DESIGNATED GROUP BROADCAST ADDRESS IS INVALID.	LOCAL STATION	
7-93	RESERVED FOR FUTURE USE		NONE
94-95	NOT USE.		NONE
96	CONNECTION NOTICE	LOCAL STATION	STORE "USER PROFILE" TYPE PARAMETER
97	DISCONNECTION NOTICE	LOCAL STATION	STORE "USER PROFILE" TYPE PARAMETER
98-127	RESERVED FOR FUTURE USE		
128	DSRC IS NOT CONNECTED.	LOCAL STATION	
129	DESTINATION PORT IS INVALID.	OPPOSITE STATION	STORE "INVALID PORT" TYPE PARAMETER
130-255	RESERVED FOR FUTURE USE		

FIG. 18

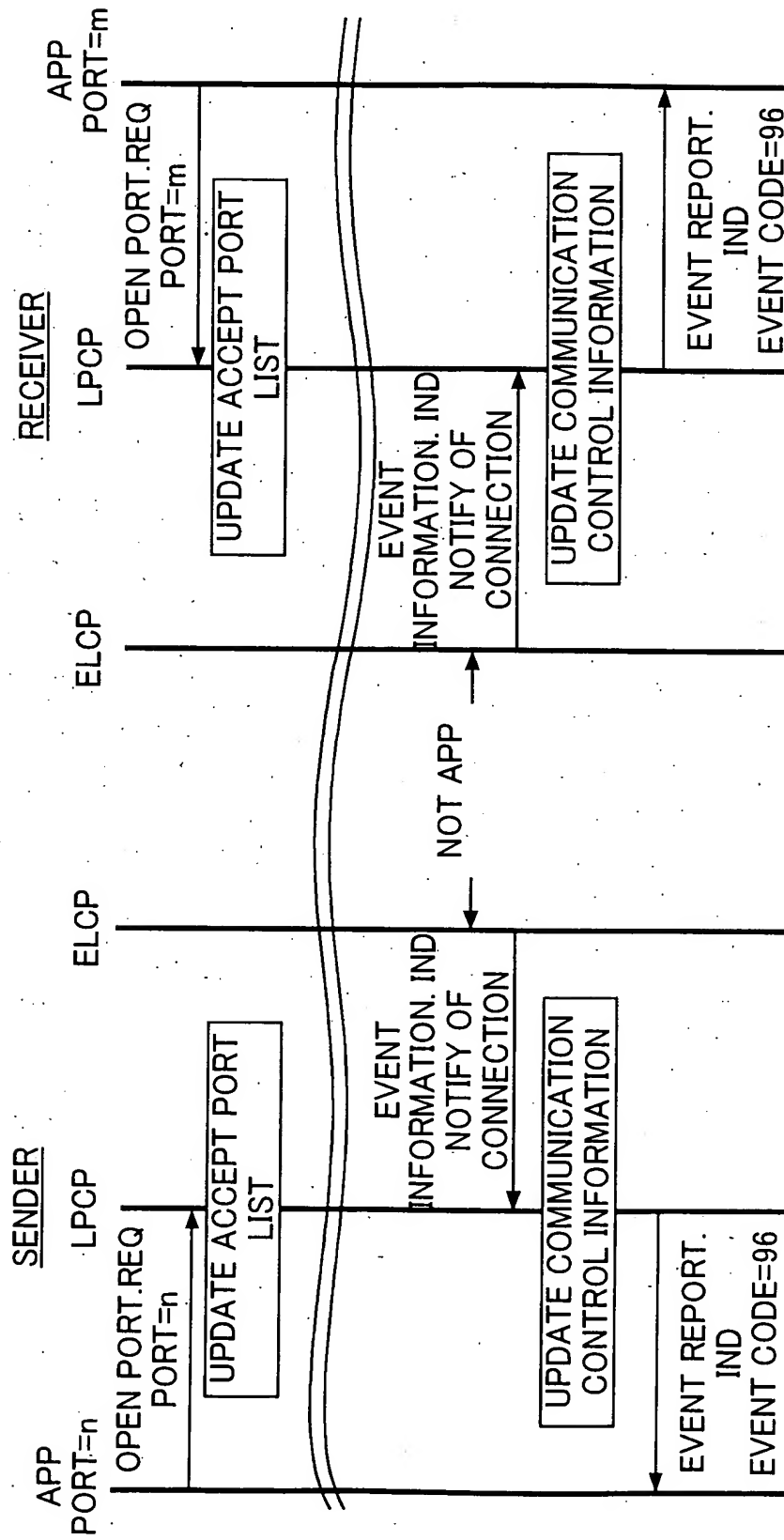


FIG. 19

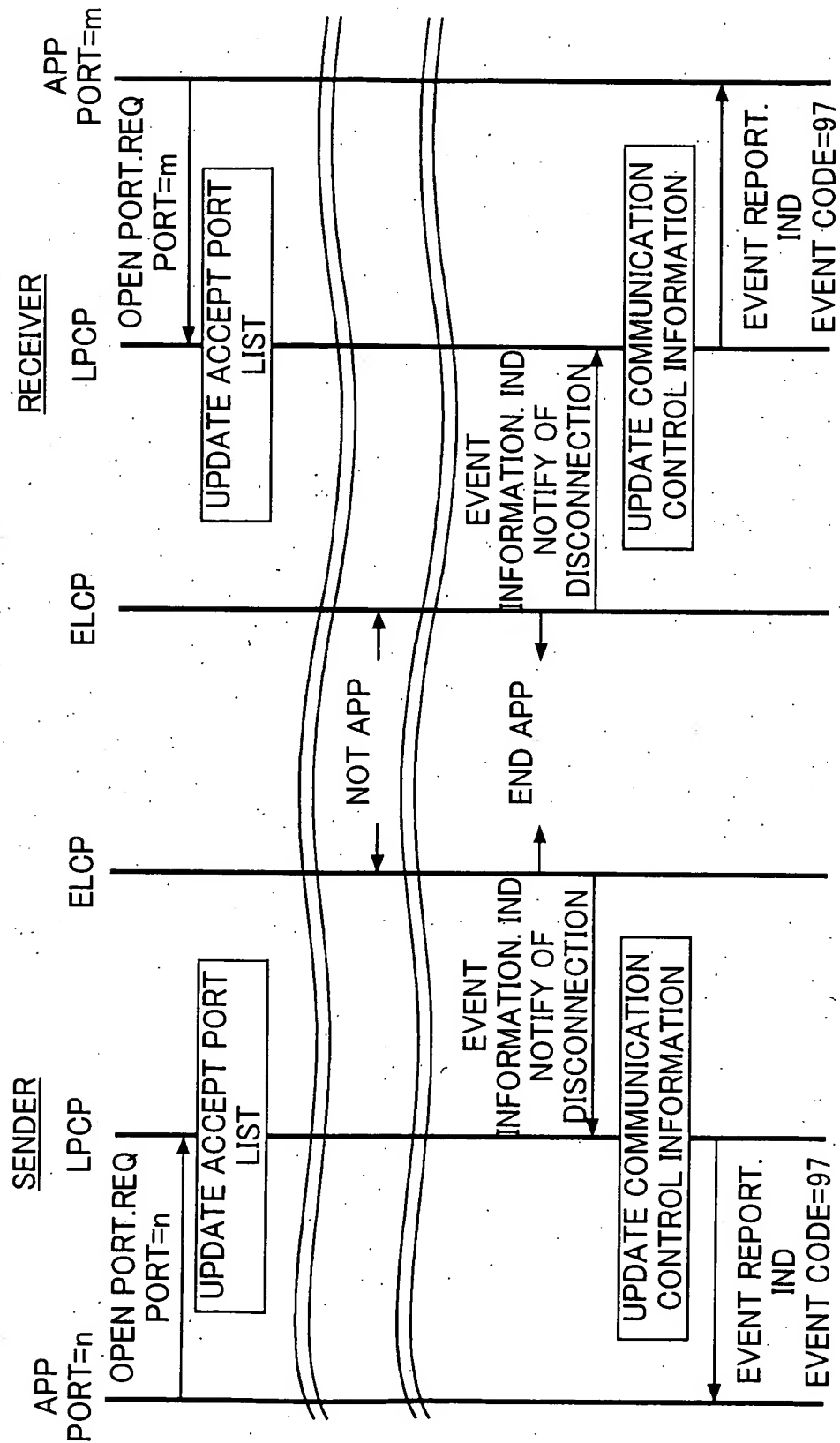


FIG. 20

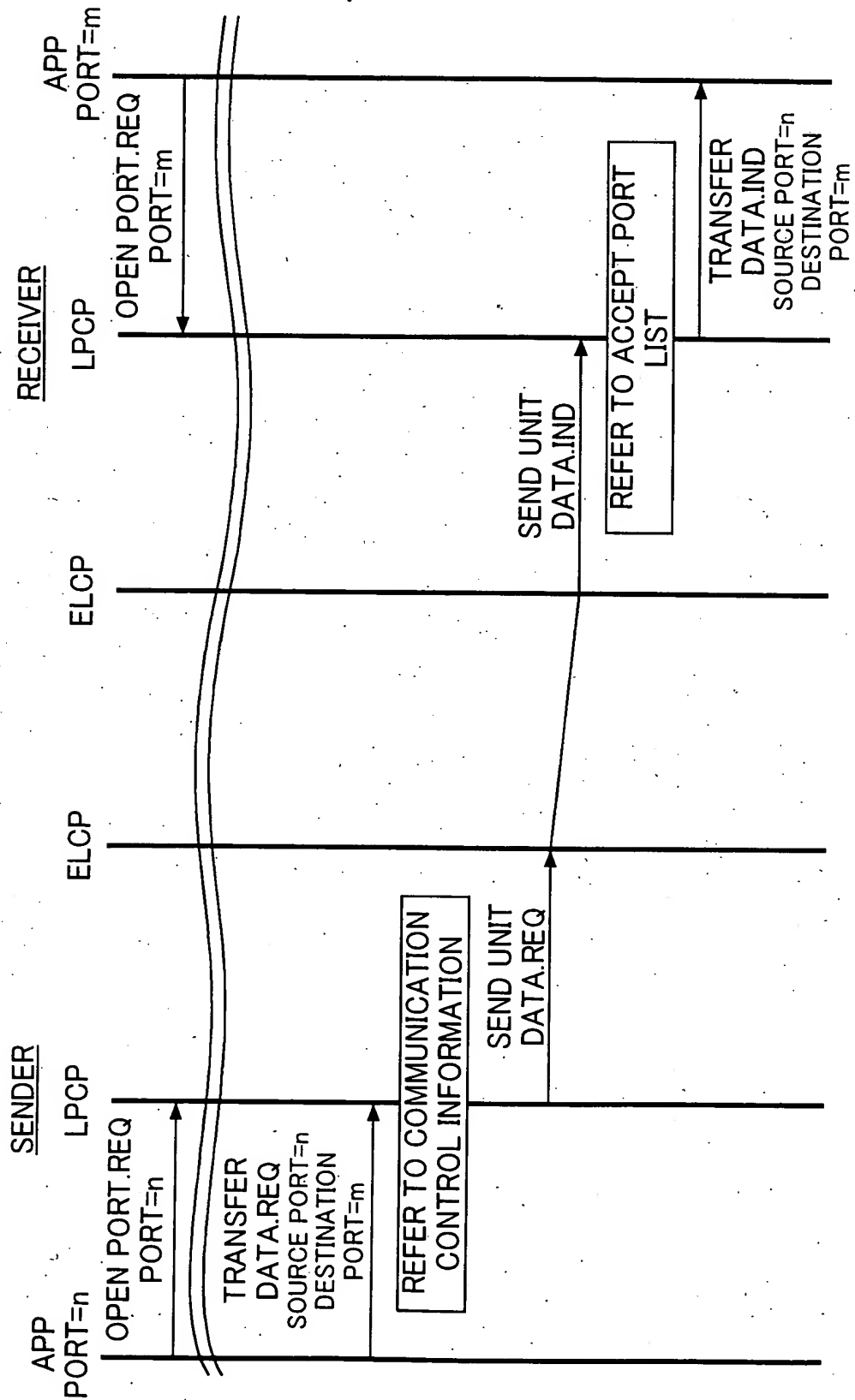


FIG. 21

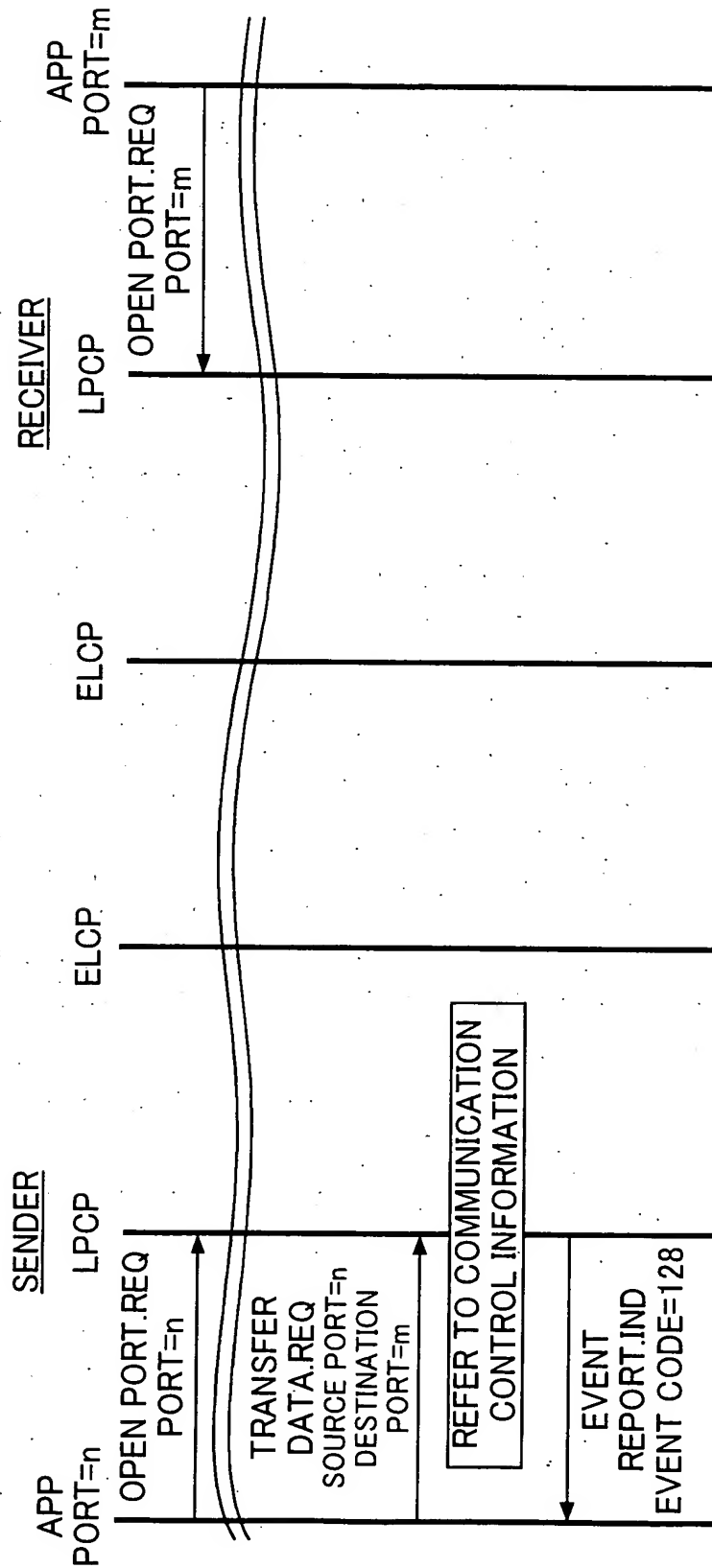


FIG. 22

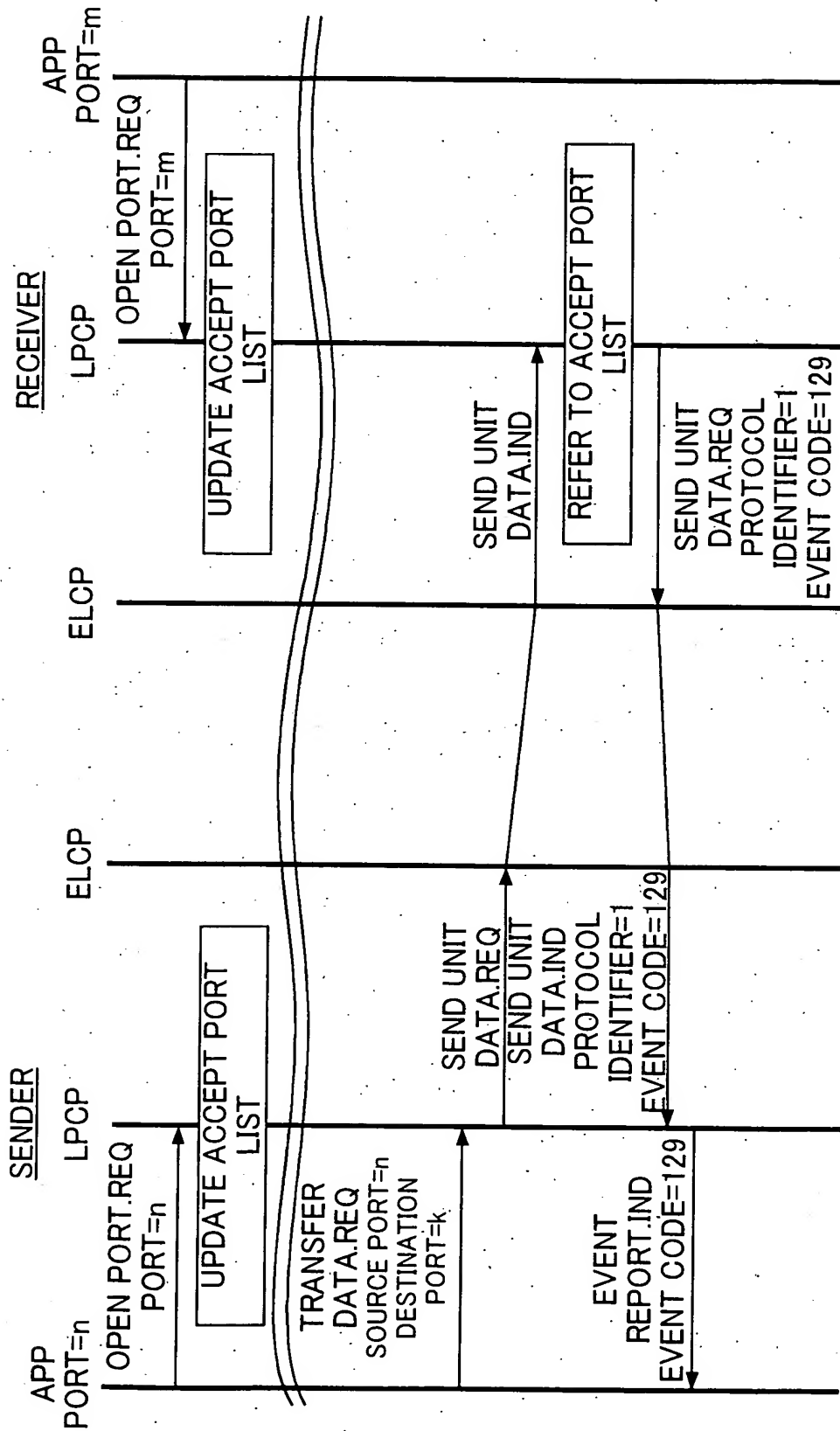


FIG. 23

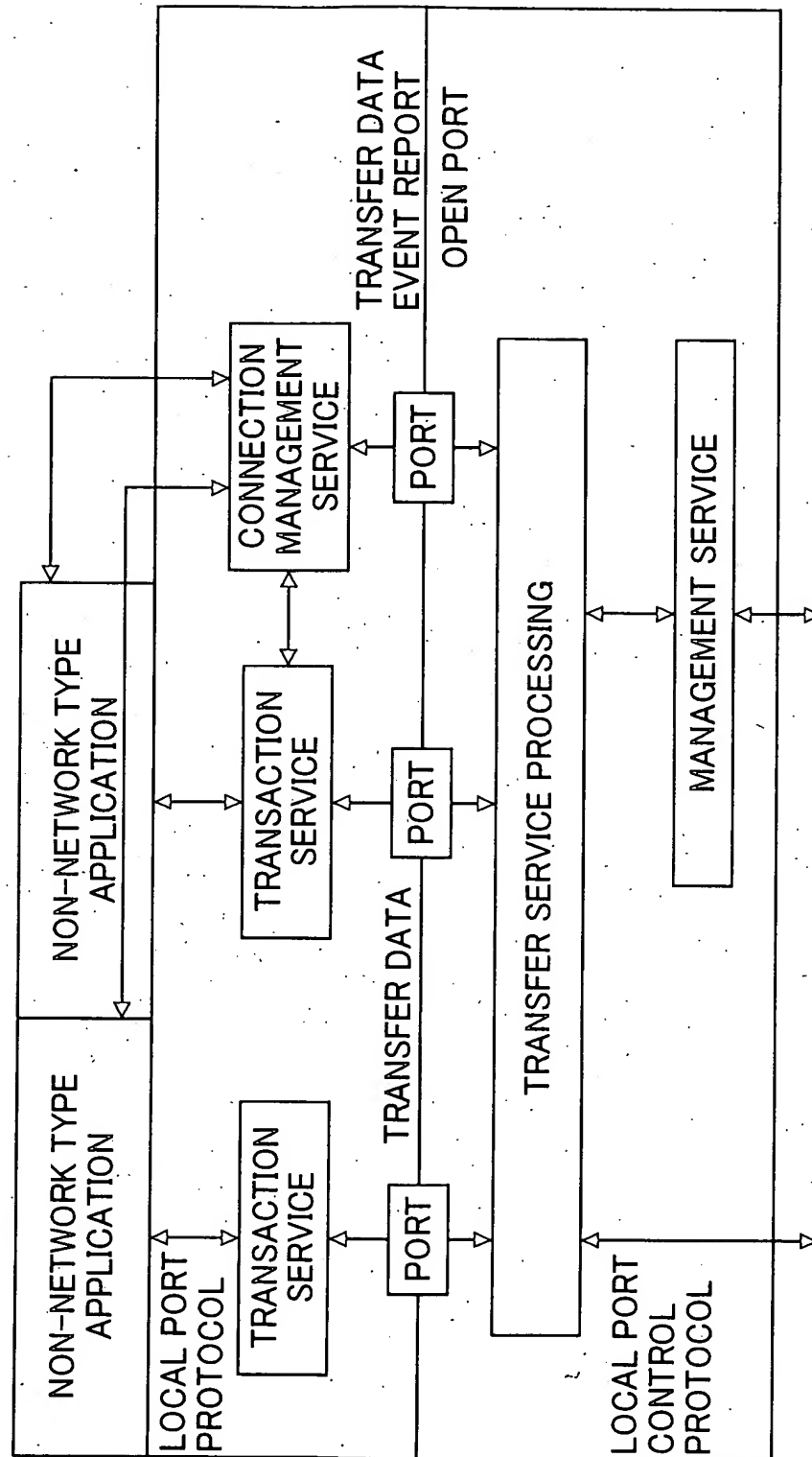


FIG. 24

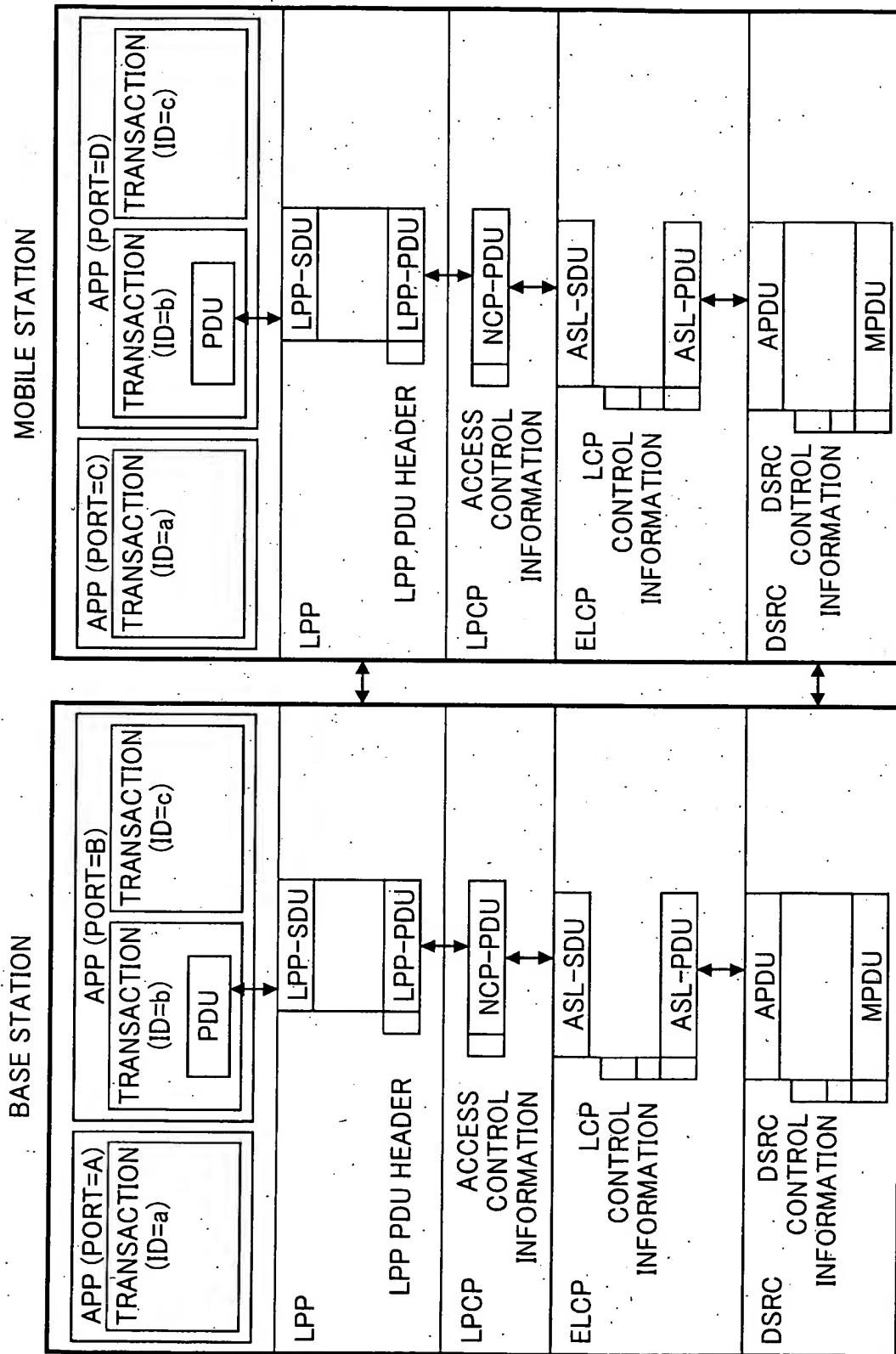


FIG. 25

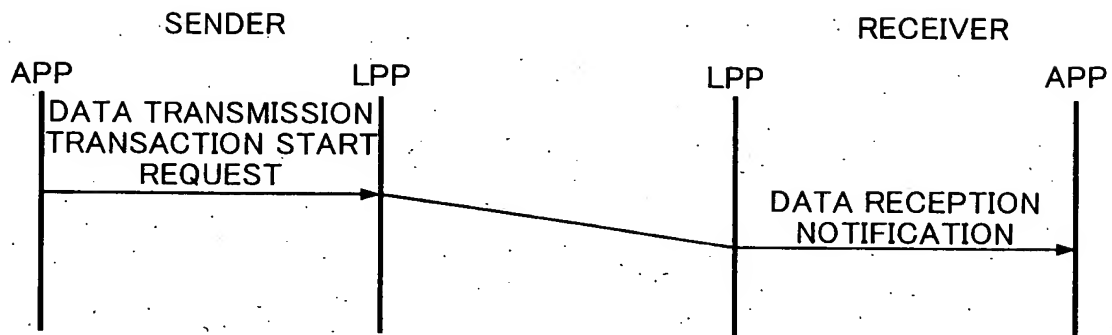


FIG. 26

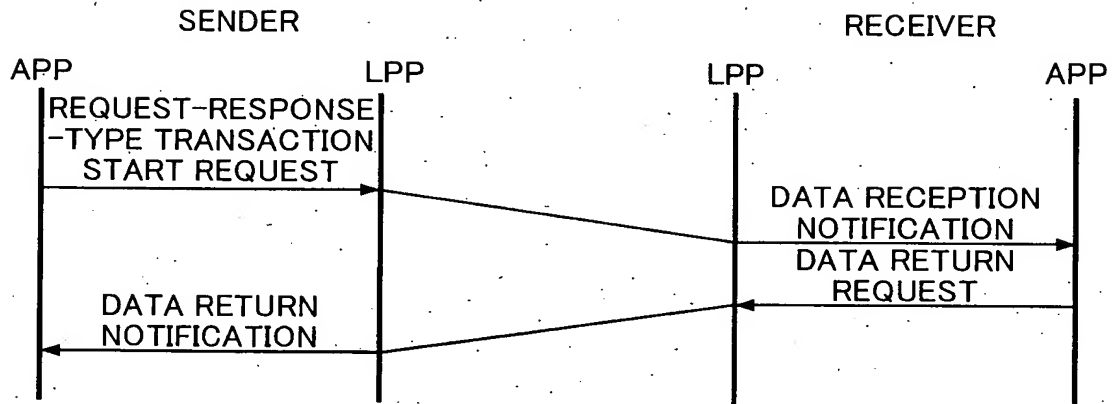


FIG. 27

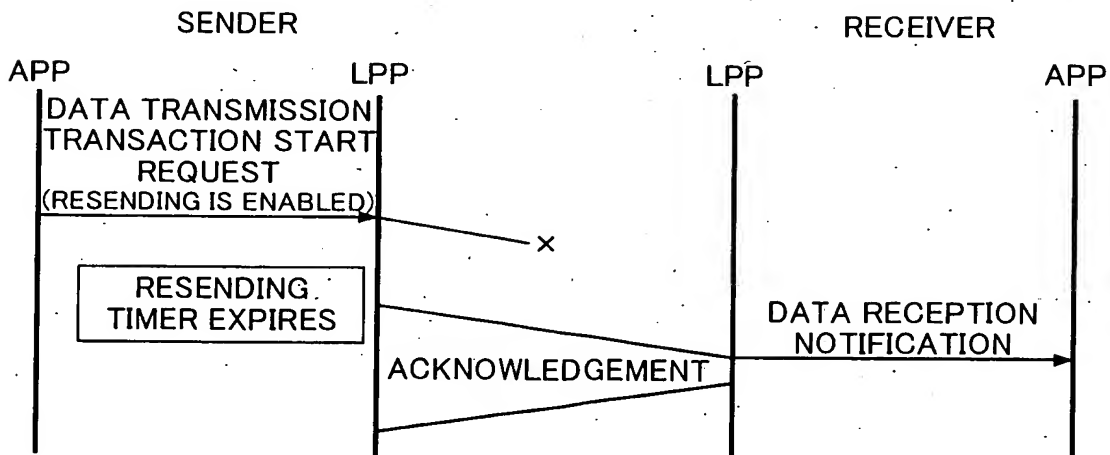


FIG. 28

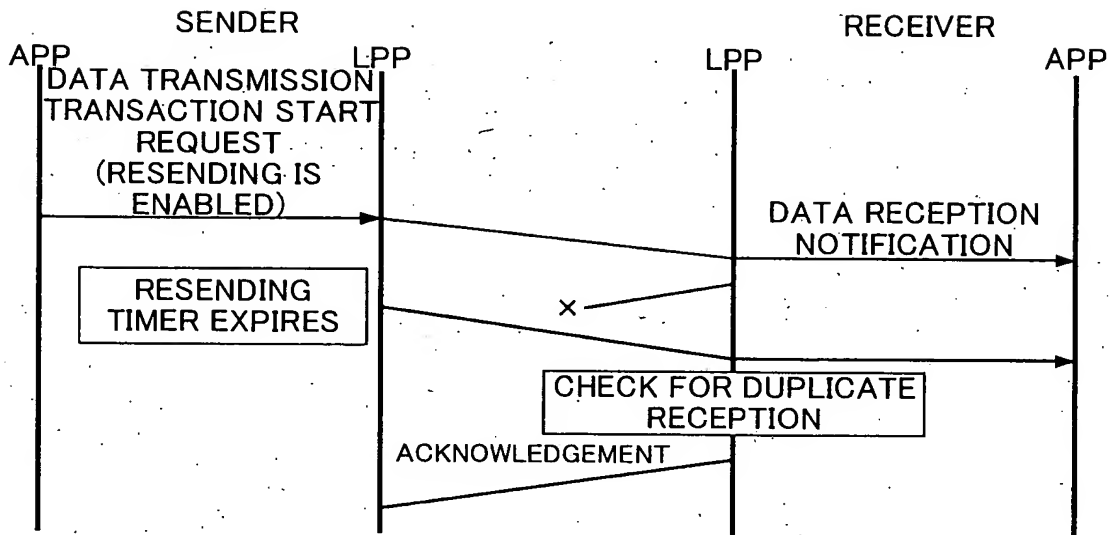


FIG. 29

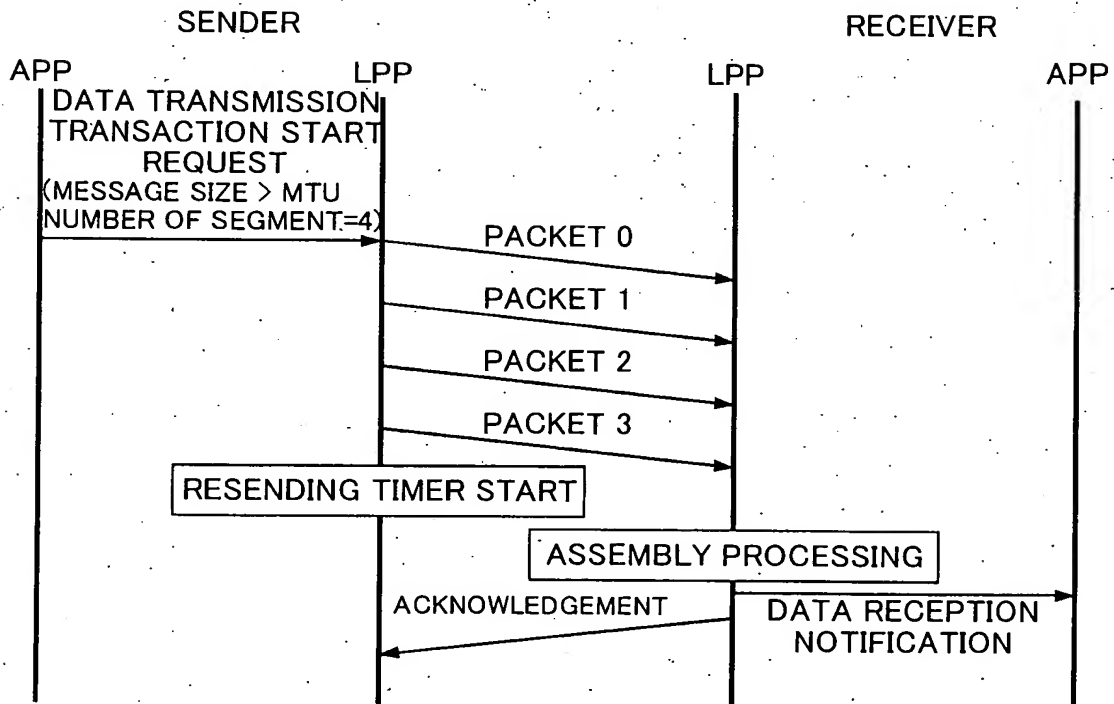


FIG. 30

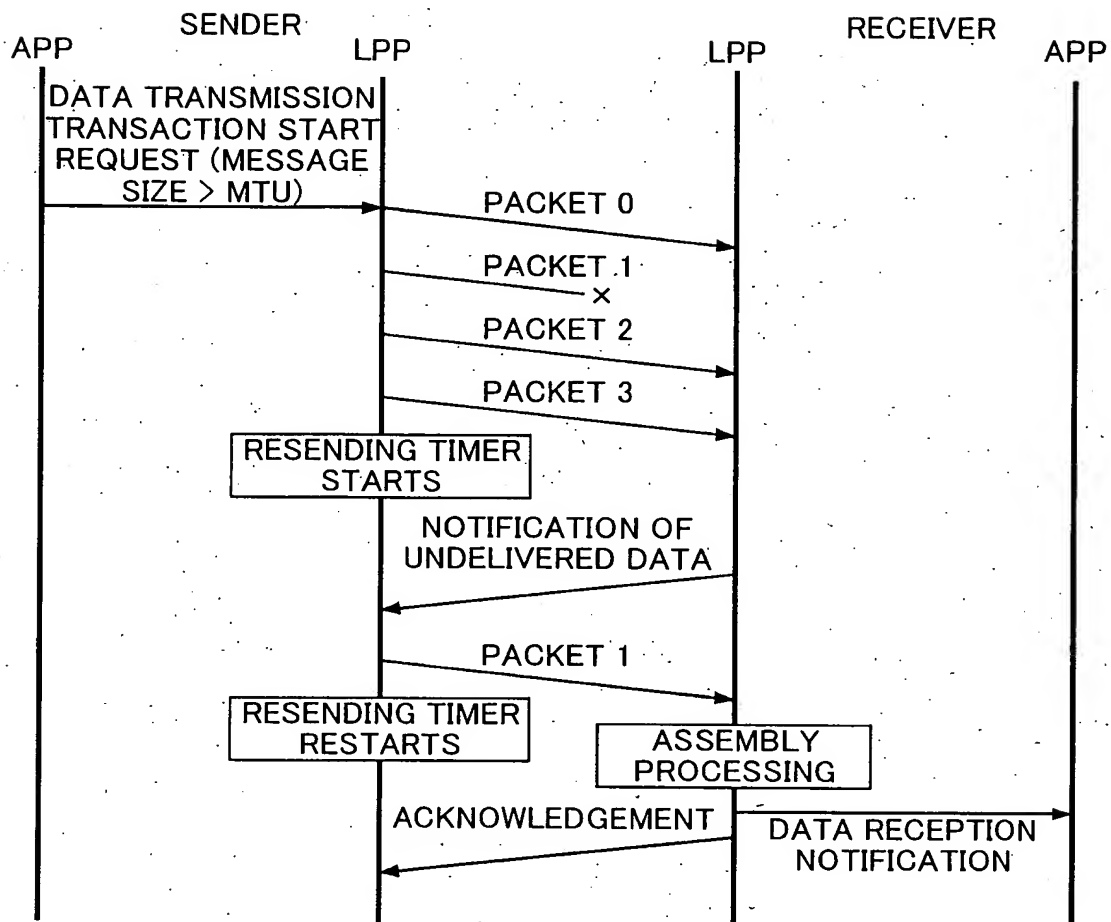


FIG. 31

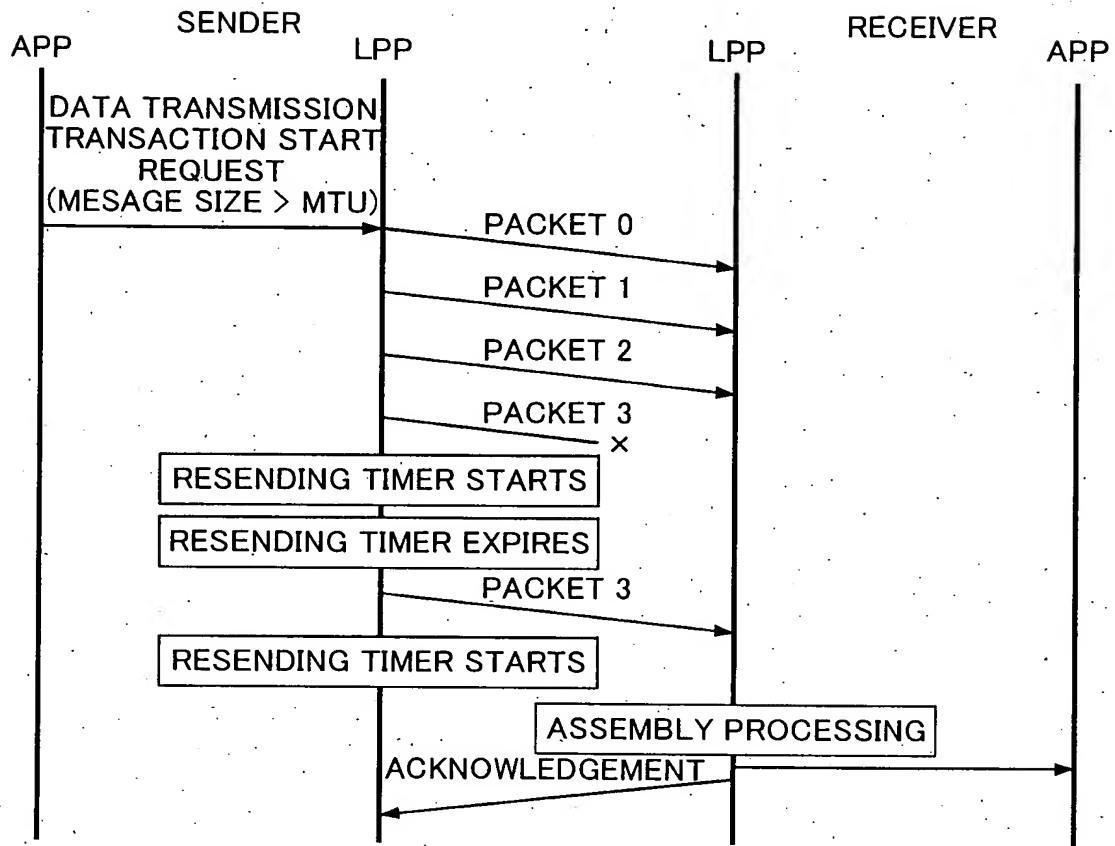


FIG. 32

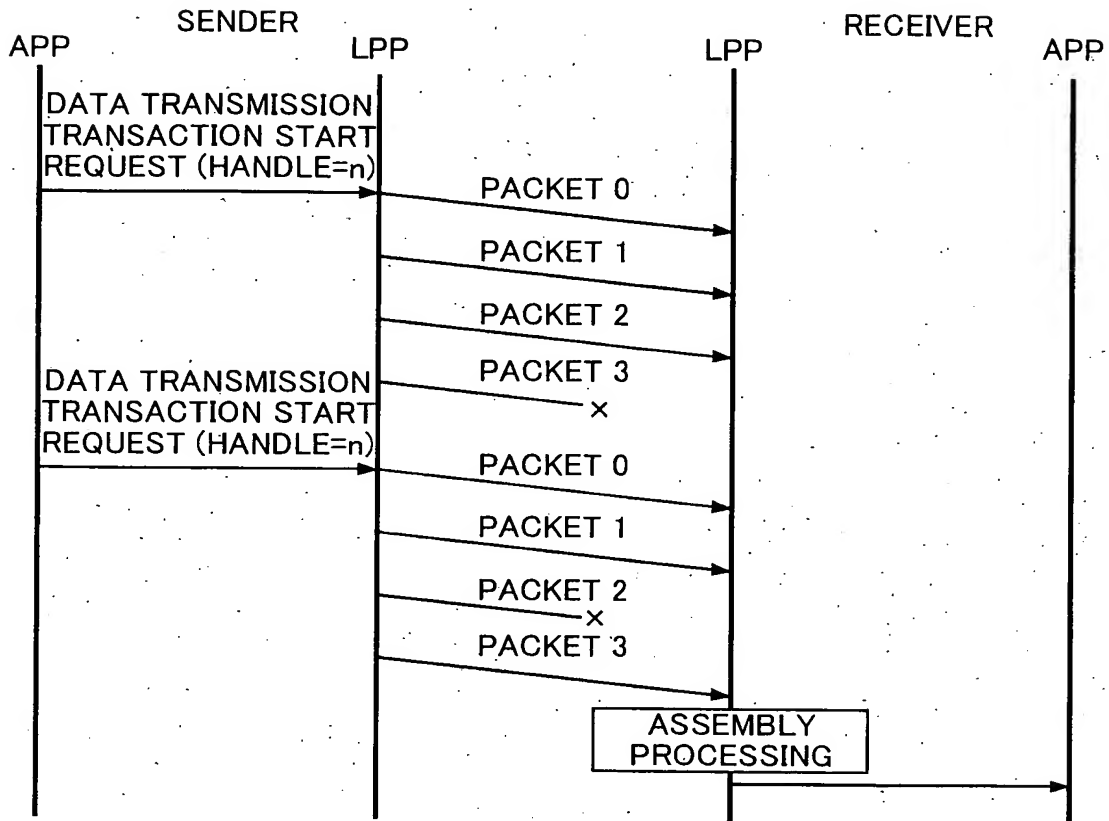


FIG. 33

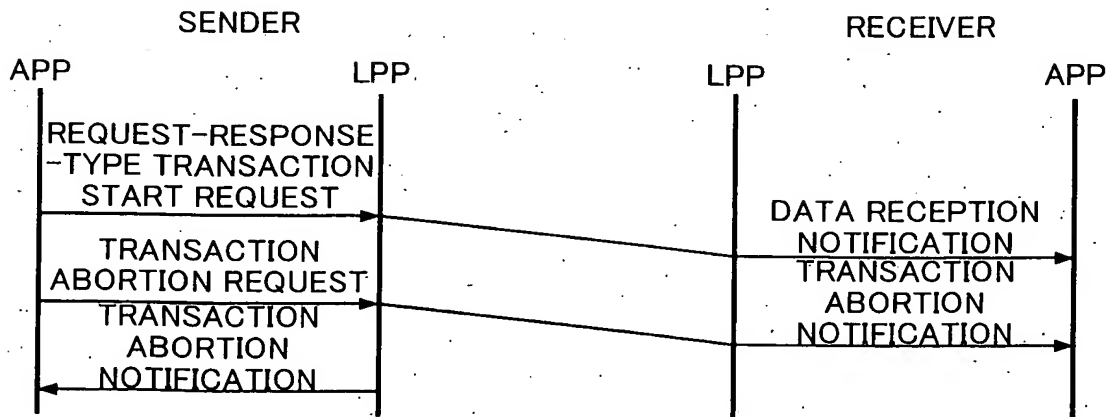


FIG. 34

PRIMITIVE TYPE	ABBREVIATION	DESCRIPTION FOR PRIMITIVE
REQUEST	REQ	USED WHEN AN UPPER LAYER REQUESTS A SERVICE FROM A LOWER LAYER.
INDICATION	IND	USED WHEN A LOWER LAYER NOTIFIERS AN UPPER LAYER OF A SERVICE FROM THE COUNTERPART.
RESPONSE	RES	USED WHEN AN UPPER LAYER GIVES A RESPONSE TO A LOWER LAYER FOR A SERVICE TO THE COUNTERPART.
CONFIRM	CNF	USED WHEN A LOWER LAYER NOTIFIES AN UPPER LAYER THAT THE REQUESTED SERVICE IS COMPLETED.

FIG. 35

SYMBOL	DESCRIPTION
M (MANDATORY)	MANDATORY PARAMETER
C (CONDITIONAL)	PARAMETER SPECIFIED WHEN SPECIFIED IN THE IMMEDIATELY PRECEDING PRIMITIVE ("REQ" IN THE CASE OF "IND", AND "RES" IN THE CASE OF "CNF")
O (OPTIONAL)	OPTIONAL PARAMETER
(=)	INDICATES THAT THE PARAMETER VALUE IS EQUIVALENT TO THE VALUE OF THE IMMEDIATELY PRECEDING PRIMITIVE ("REQ" IN THE CASE OF "IND", AND "RES" IN THE CASE OF "CNF").

FIG. 36

PARAMETER	PRIMITIVE	INVOKE			
		REQ	IND	RES	CNF
LINK ADDRESS	M	M(=)	-	-	-
SOURCE PORT	M	M(=)	-	-	-
DESTINATION PORT	M	M(=)	-	-	-
USER DATA SIZE	M	M(=)	M	M(=)	M(=)
USER DATA	O	C(=)	O	C(=)	C(=)
TRANSACTION TYPE	M	M(=)	-	-	-
REQUIRE ACK	O	-	O	-	-
RESULT TIMEOUT	O	-	-	-	-
HANDLE	M	M	M	M	M

FIG. 37

PARAMETER	PRIMITIVE	ABORT	
		REQ	IND
ABORT TYPE	O	C(=)	
ABORT CODE	O	C(=)	
HANDLE	M	M	M

FIG. 38

ABORT CODE	CODE	DESCRIPTION
UNKNOWN	0x00	-
PROTOCOL ERROR	0x01	THE RECEIVED PDU STRUCTURE IS ABNORMAL.
TID IS INVALID.	0x02	THE TID IS INVALID.
TRANSACTION SERVICE IS NOT SUPPORTED.	0x03	THE RECEIVER DOES NOT SUPPORT THE REQUEST-RESPONSE TYPE TRANSACTION SERVICE.
LPP VERSION IS DIFFERENT.	0x04	THE LPP VERSION IS DIFFERENT BETWEEN THE SENDER AND THE RECEIVER.
RECEIVE BUFFER OVERFLOW	0x05	THE RECEIVE BUFFER HAS OVERFLOWED.
MTU ERROR	0x06	BECAUSE THE SEND DATA EXCEEDED THE MTU IN THE LPCP, THE TRANSACTION COULD NOT BE STARTED (WHEN SEGMENTATION/RE-ASSEMBLY PROCESSING IS NOT SUPPORTED).
RESEND TIMER TIMEOUT	0x07	THE RESEND TIMER EXPIRED, AND THE TRANSACTION WAS ABORTED.
RESULT TIMER TIMEOUT	0x08	THE RESULT TIMER EXPIRED, AND THE TRANSACTION WAS ABORTED.
LINK ADDRESS ERROR	0x09	(POINT TO POINT) THE VEHICLE IS NOT PRESENT INSIDE THE ZONE. (BROADCAST) THE BROADCAST ADDRESS IS ILLEGAL.
DESTINATION PORT ERROR	0x0A	THE DESTINATION PORT NUMBER IS NOT PRESENT IN THE COUNTERPART.
LPP IS NOT SUPPORTED.	0x0B	THE DSRC-ASL DOES NOT SUPPORT THIS PROTOCOL.
ABORTED BY DSRC-ASL.	0x0C	BECAUSE THERE WAS NO SPACE IN THE SEND QUEUE IN THE DSRC-ASL, THE REQUESTED SERVICE WAS ABORTED.
TRANSACTION WAS NOT STARTED.	0x0D	BECAUSE THE NUMBER OF TRANSACTIONS EXCEEDED THE NUMBER WHICH CAN BE EXECUTED AT THE SAME TIME, THE TRANSACTION COULD NOT BE STARTED.
UNDER SEGMENTATION/ASSEMBLY PROCESSING	0x0E	A TRANSACTION USED SEGMENTATION/RE-ASSEMBLY PROCESSING IS BEING EXECUTED.
RESERVED	0x0F TO 0xFF	RESERVED

FIG. 39

PARAMETER	PRIMITIVE	CONNECT			
		REQ	IND	RES	CNF
QUERIST PORT	M				-
QUERY LID	O				-
QUERY PORT	O				-
TIMEOUT	O				-
CONNECTED LID	-				M
ACCEPT PORT	-				M

FIG. 40

PARAMETER	PRIMITIVE	DISCONNECT	
		REQ	IND
LINK ADDRESS		-	M

FIG. 41

PARAMETER	PRIMITIVE	ABORT
		REQ
PORT NO		M
BULK AREA		O
BULK AREA SIZE		O

FIG. 42

PARAMETER	PRIMITIVE	ABORT
		REQ
PORT NO		M

FIG. 43

PDU TYPE	USAGE SCENARIO
INVOKE	USED IN THE PRIMITIVE "INVOKE.REQ".
RESULT	USED IN THE PRIMITIVE "INVOKE.RES".
ACKNOWLEDGEMENT	USED IN ARRIVAL ACKNOWLEDGEMENT.
ABORT	USED WHEN A TRANSACTION IS ABORTED (DUE TO THE PRIMITIVE "ABORT" OR SYSTEM ERROR).
INVOKE SEGMENT	USED WHEN THE MESSAGE SIZE EXCEEDS THE MTU IN THE LPCP IN THE PRIMITIVE "INVOKE.REQ".
RESULT SEGMENT	USED WHEN THE MESSAGE SIZE EXCEEDS THE MTU IN THE LPCP IN THE PRIMITIVE "INVOKE.RES".
NACK	USED IN SELECTIVE RESEND PROCESSING FOR SEGMENTATION/ASSEMBLY PROCESSING.

FIG. 44

HEADER PORTION	DATA PORTION
----------------	--------------

FIG. 45

BIT/OCTET	0	1	2	3	4	5	6	7
1	PDU TYPE=INVOKE (0x01)			VERSION		TT	RA	RD
2	TID							
3								

FIG. 46

BIT/OCTET	0	1	2	3	4	5	6	7
1	PDU TYPE=RESULT (0x02)			RES	RES	RES	RA	RD
2	TID							
3								

FIG. 47

BIT/OCTET	0	1	2	3	4	5	6	7
1	PDU TYPE=ACK (0x03)			RES	RES	RES	RES	RD
2	TID							
3								

FIG. 48

BIT/OCTET	0	1	2	3	4	5	6	7
1	PDU TYPE=ABORT (0x04)			RES	RES	RES	RES	AT
2	TID							
3								
4	ABORT CODE							

FIG. 49

BIT/OCTET	0	1	2	3	4	5	6	7
1	PDU TYPE=INVOKE SGM (0x05)			VERSION		TT	FIN	RD
2	TID							
3								
4	SEGMENT NO							
5								

FIG. 50

BIT/OCTET	0	1	2	3	4	5	6	7
1	PDU TYPE=RESULT SGM (0x06)			RES	RES	RES	FIN	RD
2	TID							
3								
4	SEGMENT NO							
5								

FIG. 51

BIT/OCTET	0	1	2	3	4	5	6	7
1	PDU TYPE=NACK (0x07)			RES	RES	RES	RES	RD
2	TID							
3								
4	NUM SEG=n							
5								
6 . . 6+nx2	SEGMENT NUMBER LIST							

FIG. 52

BIT/OCTET	0	1	2	3	4	5	6	7
1	STATUS=ACCEPT PORT (1)							
2	NUM PORTS=n							
3								
4 . . 4+nx2	ACCEPT PORT LIST							

FIG. 53

BIT/OCTET	0	1	2	3	4	5	6	7
1	STATUS=REJECT PORT (2)							
2	REJECT PORT							

```

sequenceDiagram
    participant APP as APP (PORT=1)
    participant LPP as LPP
    participant LRPCP as LRPCP
    participant APP2 as APP (PORT=2)
    participant LPP2 as LPP
    participant LRPCP2 as LRPCP

    APP->>LPP: REGISTER PORT PORT=1
    LPP->>APP2: REGISTER PORT PORT=2
    APP->>LPP: CONNECT REQ QUERY PORT=2
    LPP->>APP2: CONNECT REQ QUERY PORT=1
    LPP->>APP: OPEN PORT REQ OPEN PORT=1 PRIMITIVE TYPE=0
    LPP->>APP2: OPEN PORT REQ OPEN PORT=2 PRIMITIVE TYPE=0
    LPP->>APP: EVENT REPORT IND EVENT CODE =DSRC CONNECTION NOTIFICATION (96) EXTENSION PARAMETER =User Profile
    LPP->>APP2: EVENT REPORT IND EVENT CODE =DSRC CONNECTION NOTIFICATION (96) EXTENSION PARAMETER =User Profile
    LPP->>APP: TRANSFER DATA REQ LID=link Address DEST PORT=0x0FFF STATUS=1 PORT LIST={1}
    LPP->>APP2: TRANSFER DATA REQ LID=link Address DEST PORT=0x0FFF STATUS=1 PORT LIST={2}
    LPP->>APP: SEND UNIT DATA NOTIFICATION OF ACCEPT PORT NUMBER
    LPP->>APP2: SEND UNIT DATA NOTIFICATION OF ACCEPT PORT NUMBER
    LPP->>APP: UPDATE OF CONNECTION MANAGEMENT TABLE
    LPP->>APP2: UPDATE OF CONNECTION MANAGEMENT TABLE
    LPP->>APP: TRANSFER DATA REQ
    LPP->>APP2: TRANSFER DATA REQ
    LPP->>APP: INVOKE REQ DEST=2
    LPP->>APP2: INVOKE REQ DEST=2
    LPP->>APP: CONNECT CNF LID=link Address ACCEPT PORT=2
    LPP->>APP2: CONNECT CNF LID=link Address ACCEPT PORT=1
  
```

```

sequenceDiagram
    participant APP as APP (PORT=1)
    participant LPP as LPP
    participant LPCP as LPCP
    participant APP2 as APP (PORT=2)
    participant LPP2 as LPP
    participant LPCP2 as LPCP

    APP->>LPP: REGISTER PORT PORT=1
    LPP->>LPCP: OPEN PORT.REQ OPEN PORT=1 PRIMITIVE TYPE=0
    LPP->>APP: EVENT REPORT.IND EVENT CODE =DSRC CONNECTION NOTIFICATION (96) EXTENSION PARAMETER =User Profile
    LPP->>LPCP: MAKE UP OF CONNECTION MANAGEMENT TABLE
    LPP->>APP: CONNECT.CNF LID=link Address ACCEPT PORT=0
    LPP->>LPCP: TRANSFER DATA.REQ
    LPP->>APP: INVOKE.REQ DEST PORT=2
    LPP->>LPCP: TRANSFER DATA.REQ
    LPP->>APP: EVENT REPORT.IND EVENT CODE=129 EXTENSION PARAMETER=3
    LPP->>LPCP: UPDATE OF CONNECTION MANAGEMENT TABLE
    LPP->>APP: ABORT.IND
    APP2->>LPP2: REGISTER PORT PORT=2
    LPP2->>LPCP2: OPEN PORT.REQ OPEN PORT=2 PRIMITIVE TYPE=0
    LPP2->>APP2: EVENT REPORT.IND EVENT CODE =DSRC CONNECTION NOTIFICATION (96) EXTENSION PARAMETER =User Profile
    LPP2->>LPCP2: MAKE UP OF CONNECTION MANAGEMENT TABLE
    LPP2->>APP2: CONNECT.CNF LID=link Address ACCEPT PORT=0
    LPP2->>LPCP2: TRANSFER DATA.IND
    LPP2->>APP2: INVOKE.IND DEST PORT=3
  
```

FIG. 56

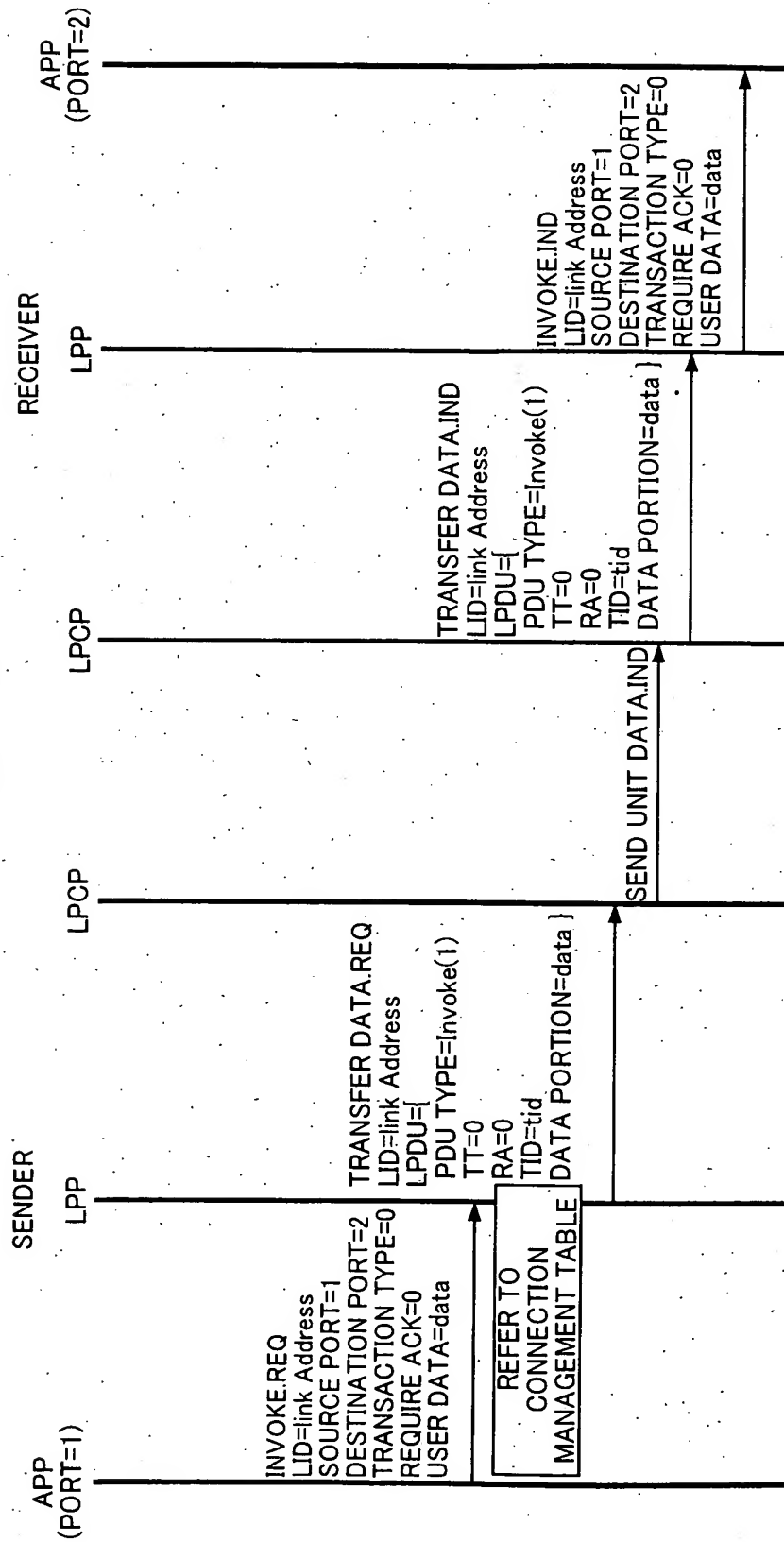


FIG. 57

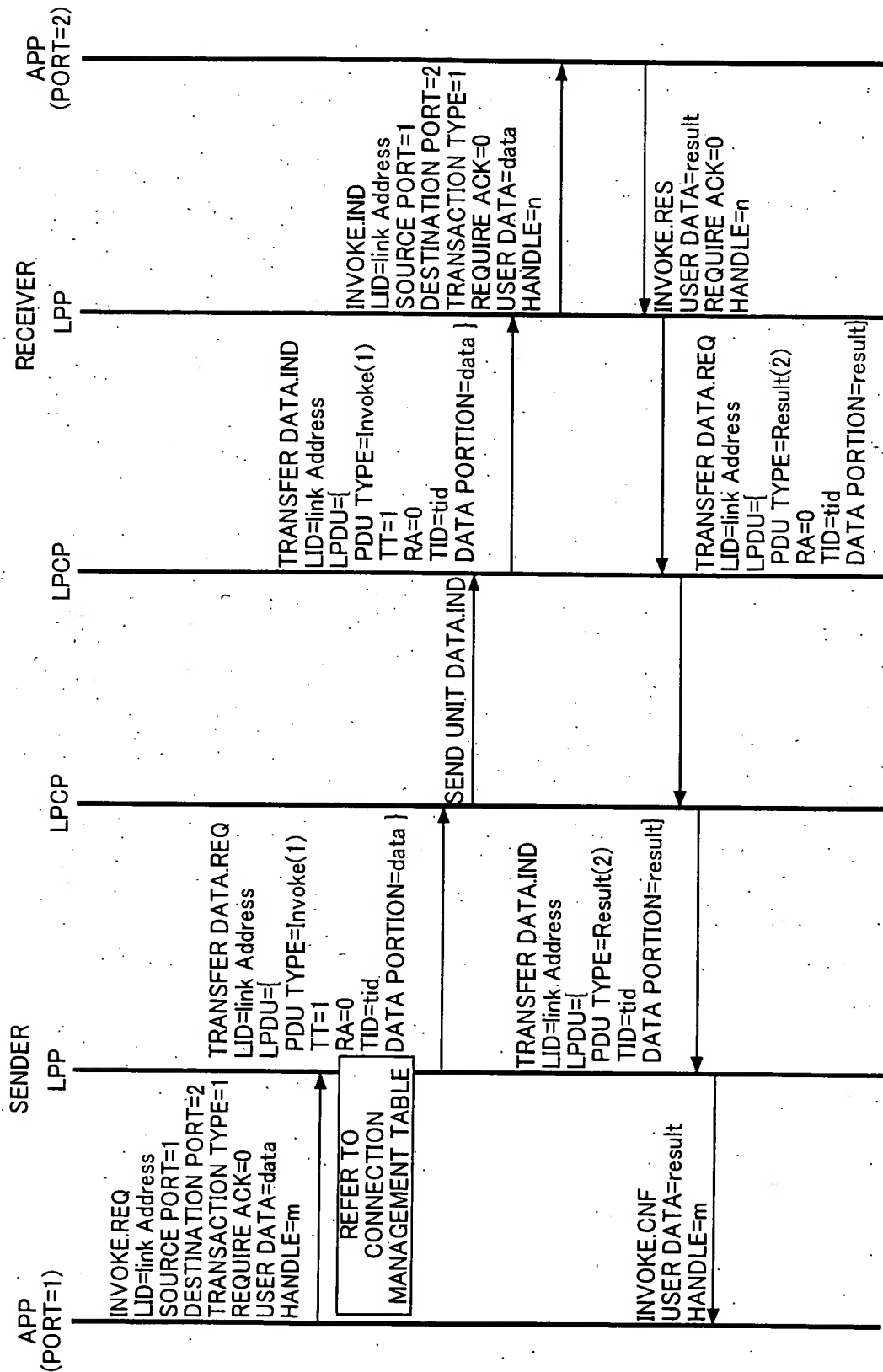


FIG. 58

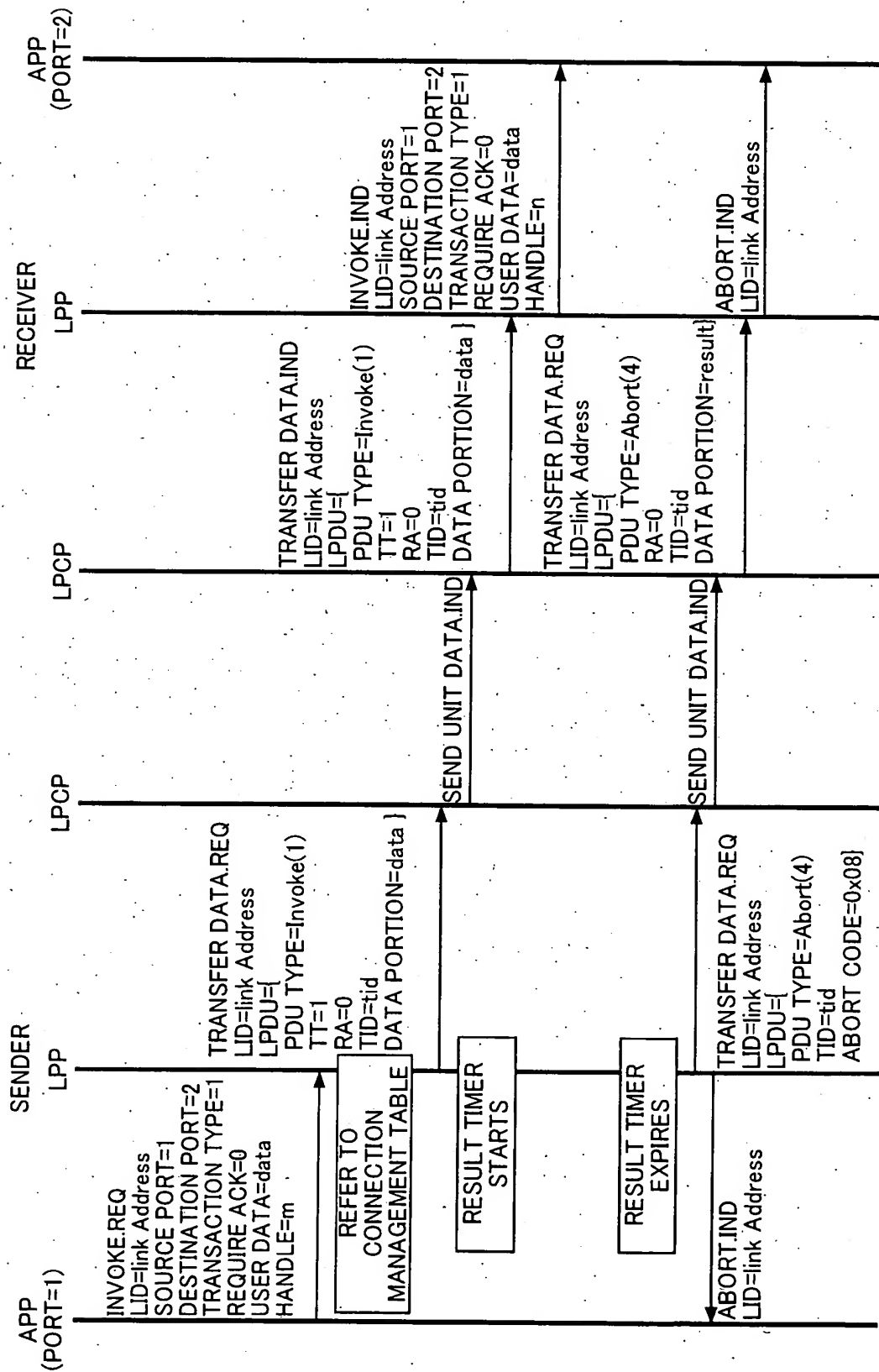


FIG. 59

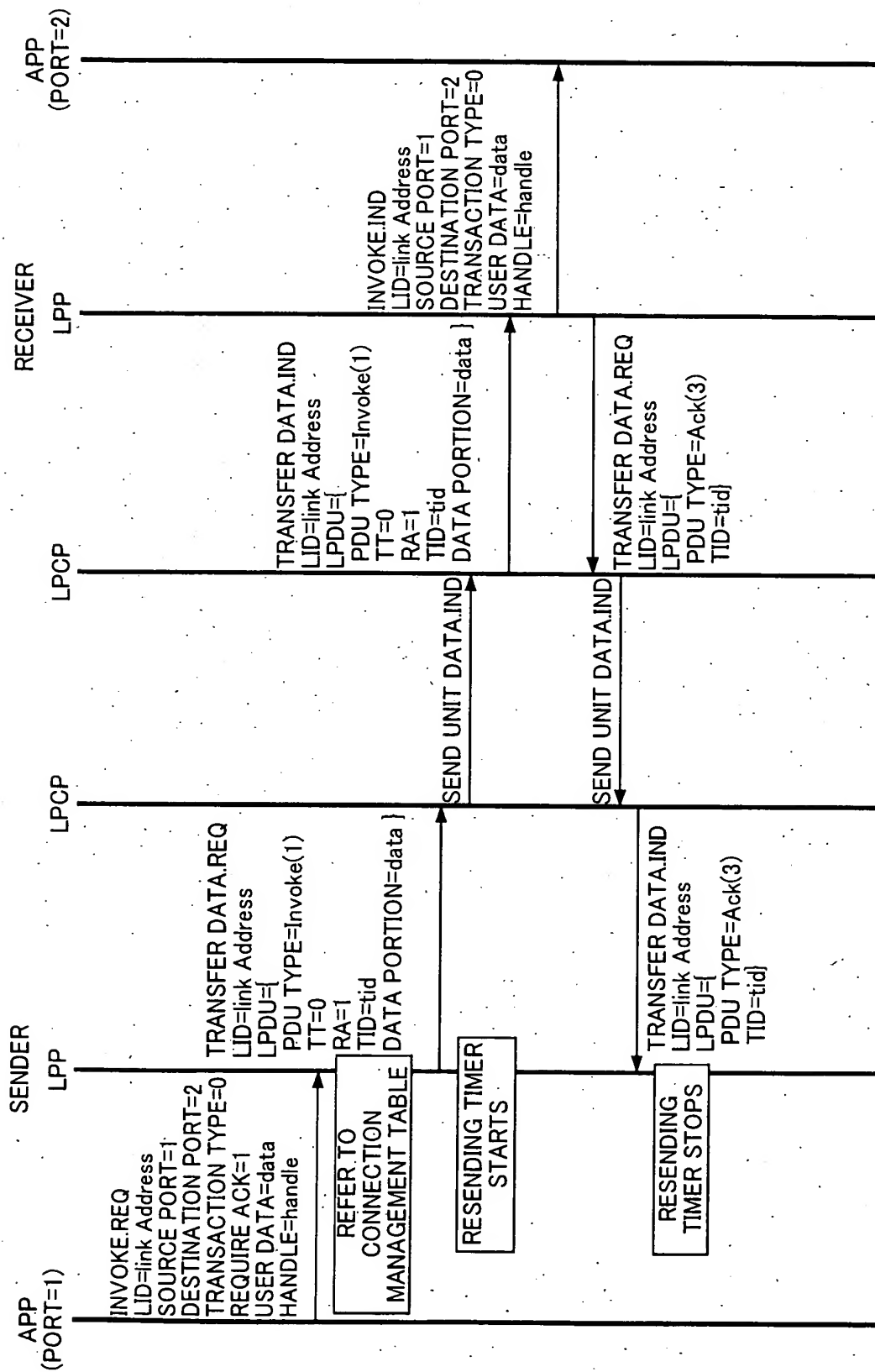
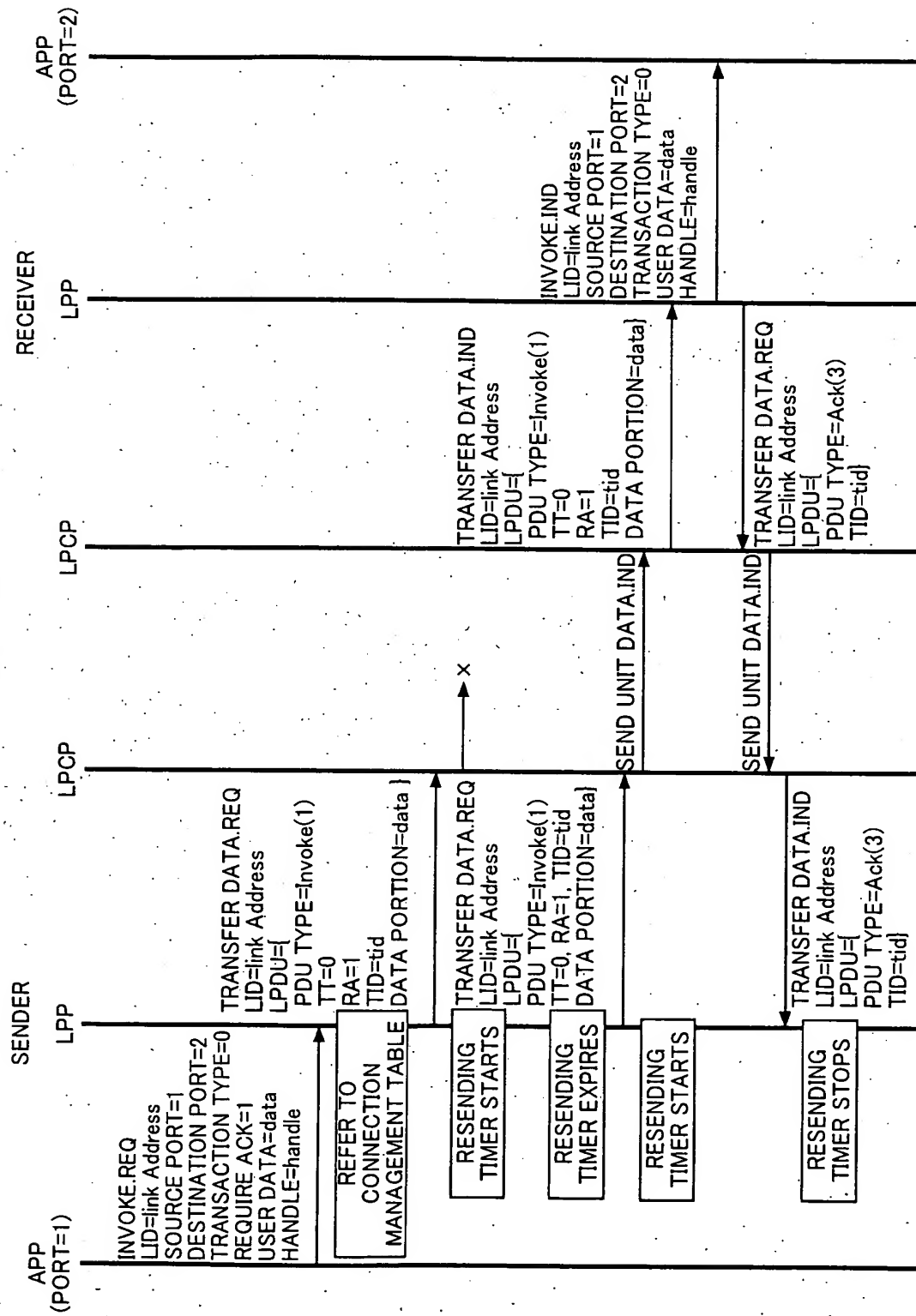


FIG. 60



```

sequenceDiagram
    participant S_APP as APP (PORT=1)
    participant S_LPP as LPP
    participant S_LPCP as LPCP
    participant R_LPCP as LPCP
    participant R_LPP as LPP
    participant R_APP as APP (PORT=2)

    S_APP->>S_LPP: INVOKE.REQ  
LID=link Address  
SOURCE PORT=1  
DESTINATION PORT=2  
TRANSACTION TYPE=0  
REQUIRE ACK=1  
USER DATA=data  
HANDLE=handle
    S_LPP->>S_LPCP: TRANSFER DATA.REQ  
LID=link Address  
LPDU={  
PDU TYPE=Invoke(1)  
TT=0, RA=1, RD=0  
TID=tid  
DATA PORTION=data }
    S_LPCP->>R_LPCP: TRANSFER DATA.REQ  
LID=link Address  
LPDU={  
PDU TYPE=Invoke(1)  
TT=0, RA=1, RD=1  
TID=tid  
DATA PORTION=data }
    R_LPCP->>R_LPP: TRANSFER DATA.REQ  
LID=link Address  
LPDU={  
PDU TYPE=Abort(4)  
ABORT CODE=0x07 }
    R_LPP->>R_APP: TRANSFER DATA.IND  
LID=link Address  
LPDU={  
PDU TYPE=Abort(4)  
ABORT CODE=0x07 }

    S_LPCP-->>S_LPCP: x
    S_LPCP-->>S_LPCP: x
    S_LPCP-->>R_LPCP: SEND UNIT DATA.IND
  
```

The diagram illustrates the sequence of events in a communication system involving three layers: APP (Application), LPP (Link Protocol), and LPCP (Link Control Protocol) on both the SENDER and RECEIVER sides.

Sender Side:

- APP (PORT=1)** initiates the process by sending **INVOKE.REQ** to **LPP**. The request includes: LID=link Address, SOURCE PORT=1, DESTINATION PORT=2, TRANSACTION TYPE=0, REQUIRE ACK=1, USER DATA=data, and HANDLE=handle.
- LPP** sends **TRANSFER DATA.REQ** to **LPCP**. The request includes: LID=link Address, LPDU={ PDU TYPE=Invoke(1), TT=0, RA=1, RD=0, TID=tid, DATA PORTION=data }.
- LPCP** sends **TRANSFER DATA.REQ** to the **RECEIVER LPCP**. The request includes: LID=link Address, LPDU={ PDU TYPE=Invoke(1), TT=0, RA=1, RD=1, TID=tid, DATA PORTION=data }.
- LPCP** on the sender side has two retransmission events: **RESENDING TIMER STARTS** and **RESENDING TIMER EXPIRES**, both indicated by an 'x'.
- LPCP** sends **SEND UNIT DATA.IND** to the **RECEIVER LPCP**.

Receiver Side:

- RECEIVER LPCP** sends **TRANSFER DATA.REQ** to **RECEIVER LPP**. The request includes: LID=link Address, LPDU={ PDU TYPE=Abort(4), ABORT CODE=0x07 }.
- RECEIVER LPP** sends **TRANSFER DATA.IND** to **RECEIVER APP (PORT=2)**. The indication includes: LID=link Address, LPDU={ PDU TYPE=Abort(4), ABORT CODE=0x07 }.

FIG. 62

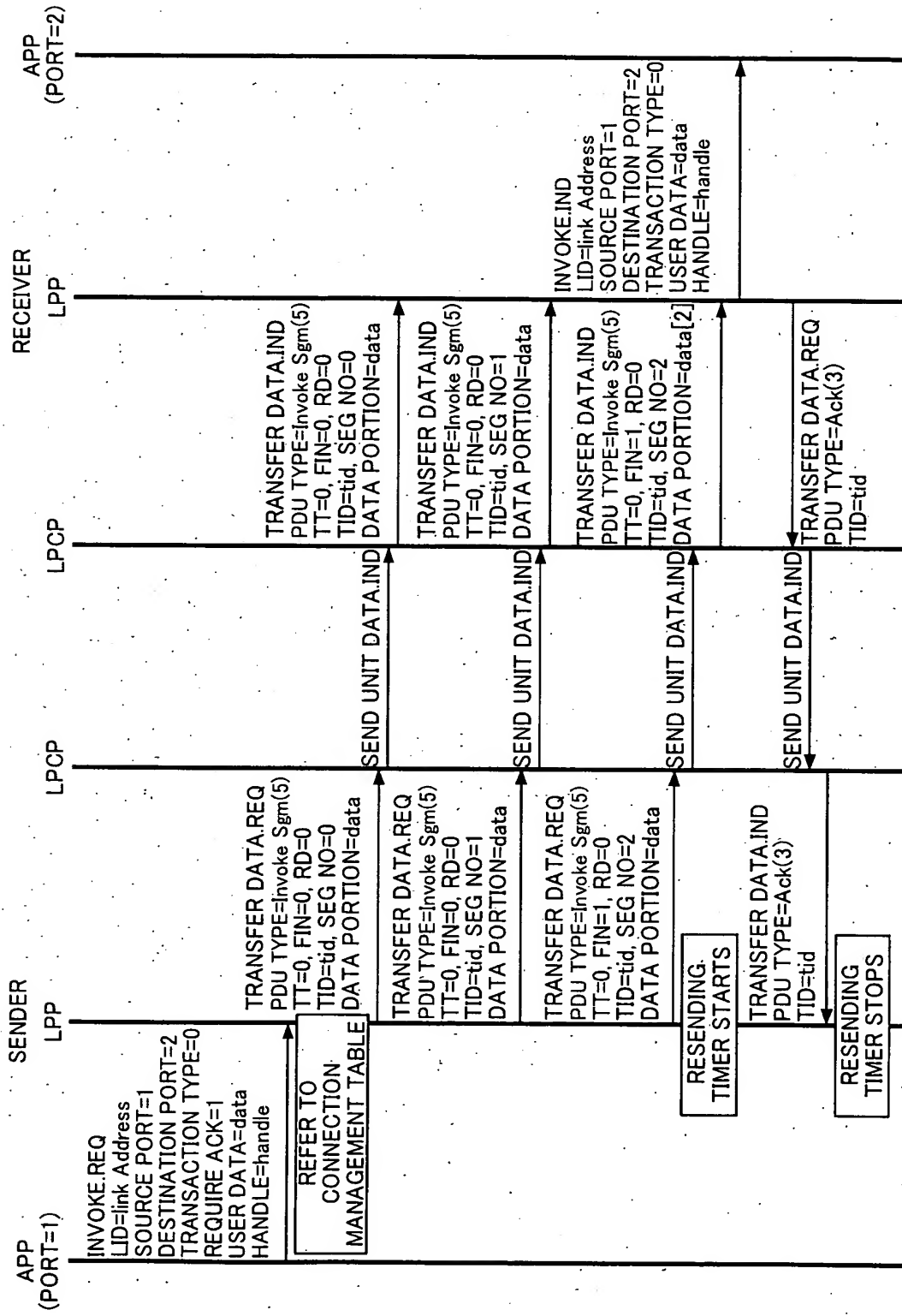


FIG. 63

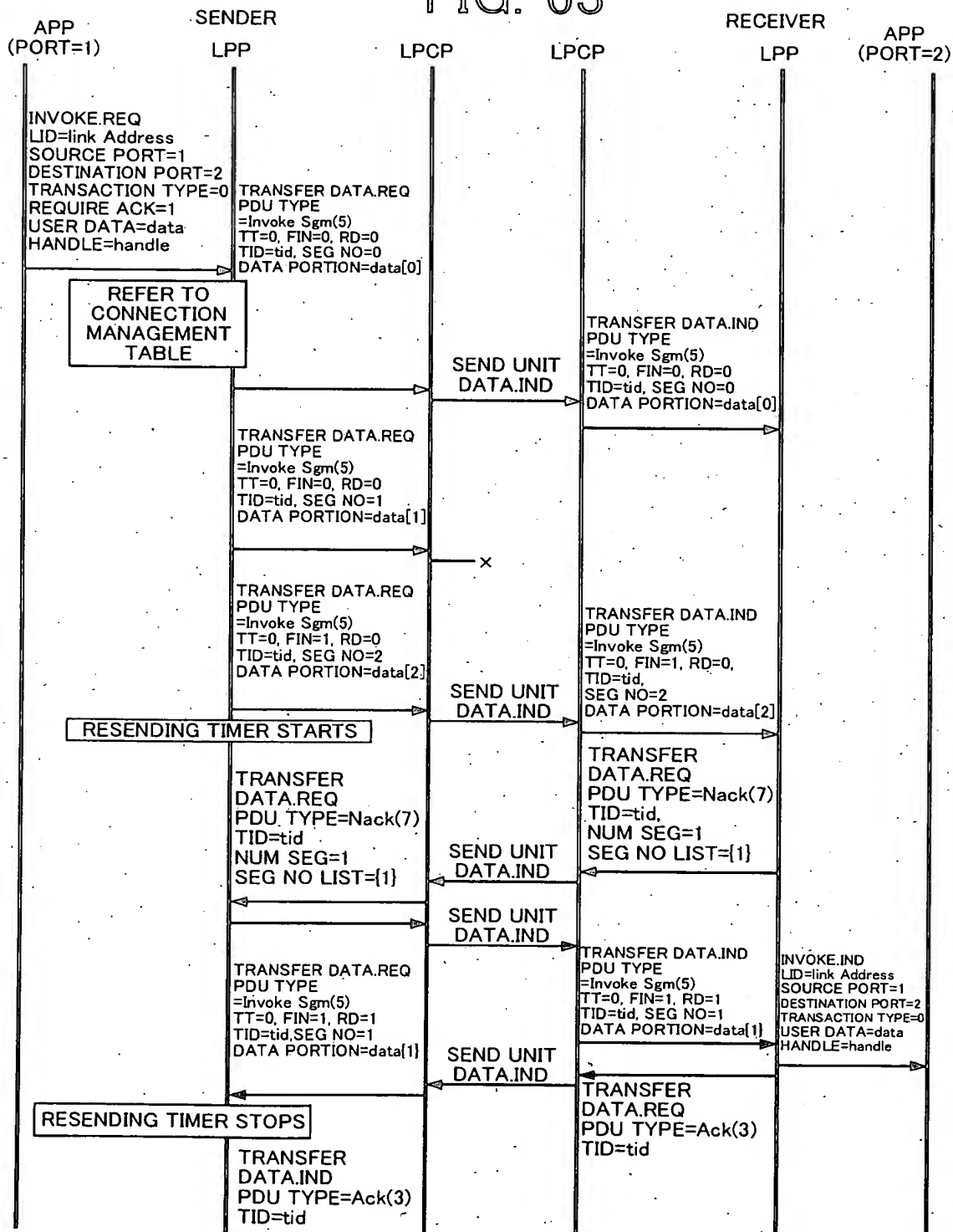


FIG. 64

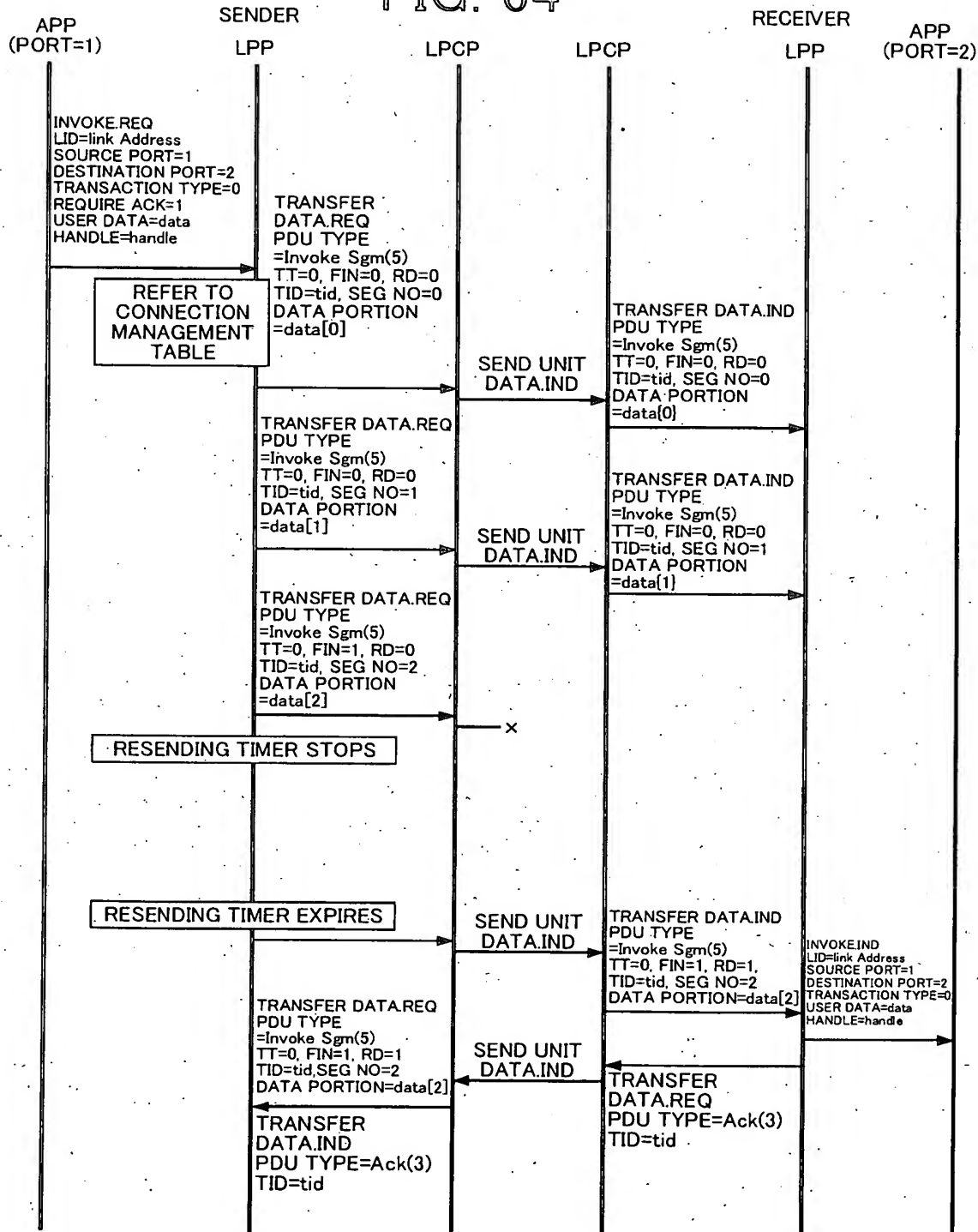


FIG. 65

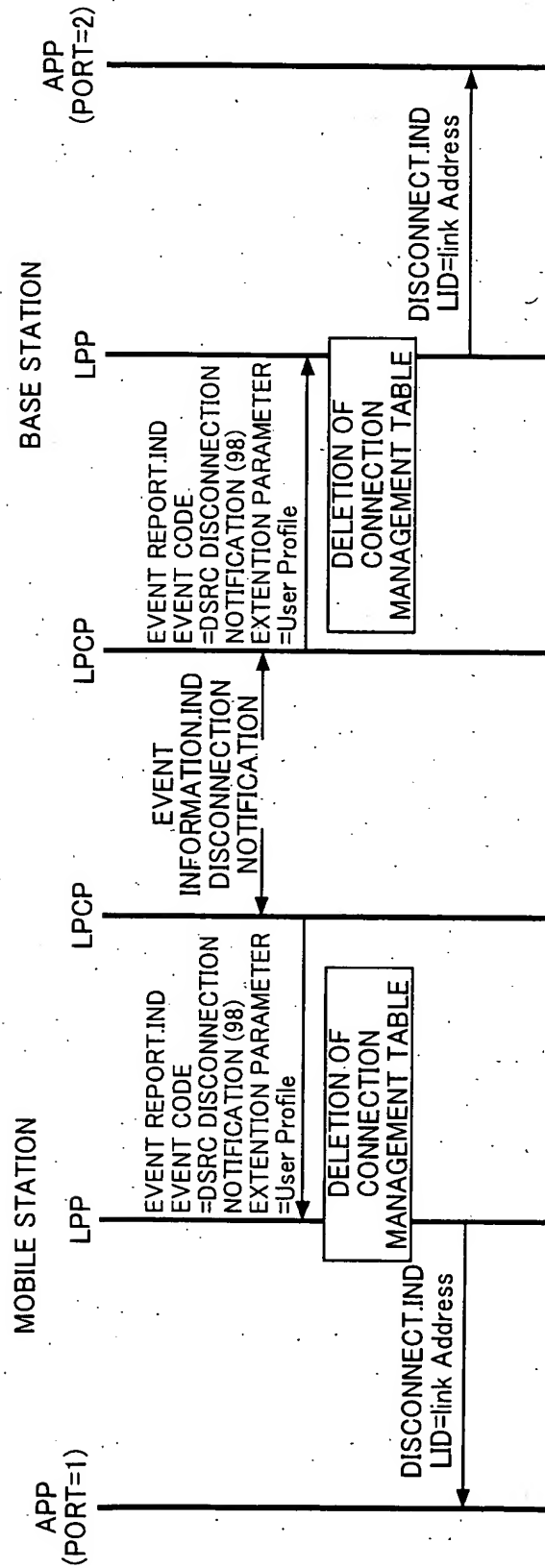


FIG. 66

